JANUARY FEBRUARY 1953

SIGNAL

Communications—Electronics—Photography

Radar Traffic Control—Washington National Airport

MANUALS BRANCH ELECTRONICS DIV.
AIR COMMAND & STAFF SCHOOL

Guide words for today —

"In order that the patriotism and intelligence of the country shall prevail in our legislation, the patriotic and intelligent men of the country must see to it that they are properly represented in our national councils. If they fail in this they will be governed by those who simply make a trade of politics. If it is well that our legislation be influenced by the enlightened and practical business sense of the people, our business men must see to it that those they trust are chosen as their lawmakers. If they are indifferent on the subject the vast interests which so greatly concern them and their fellow citizens will be left at the mercy of those who neither understand nor care for them; and I do not believe these dangers will be effectively averted until they are better understood by the people and more thoroughly resisted."

— GROVER CLEVELAND

address before the Commercial Club of Providence, R. I. June 27, 1891

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Sergeant Donald McIntyre, former telephone installer, returned home from Korea a few months ago. He served with the 1st Marine Division and was twice awarded the Purple Heart.

He was welcomed back to his telephone job, of course. But in a certain sense he had never been away. For his new pay check reflected the increases he would have received on his old job if he had not joined the Marines.

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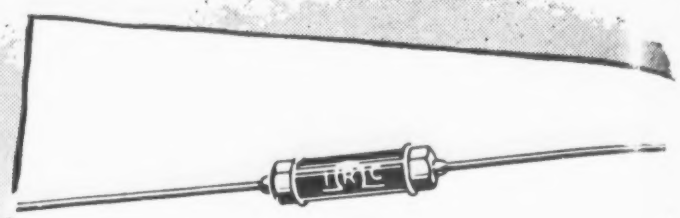
Smallest Fixed Composition Resistor in the World

Type BTR-⅓ watt. Meets JAN-R-11 Specifications, Filament-type resistance element, extra-Bakelite-sealed against moisture and humidity. Body less than ½'' long—3/32'' in diameter. Anchored, non-loosening leads. Low operating temperature and high power dissipation. Resistance change less than 1% under 5-hour vibration test. Easily meets rigorous requirements of avionic equipment. Send for full details in Data Bulletin B-1.

Small, Deposited Carbon PRECISTOR

Type DCC—½, 1 and 2 watts—Combines accuracy and economy with high stability, low voltage coefficient, low capacitive and inductive reactance in high frequency applications. Resistance body size 9/16'' x 5/32''. Excellent for circuits where carbon compositions are unsuitable and wire wound precisions too large or expensive. Designed to meet Signal Corps Specification MIL-R-10509A. Full technical information in Data Bulletin B-7.



New Boron-Carbon PRECISTOR— Ultimate in Stable Non-Wire Wounds

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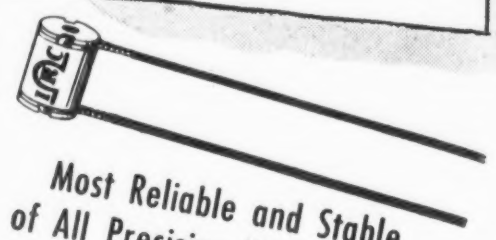

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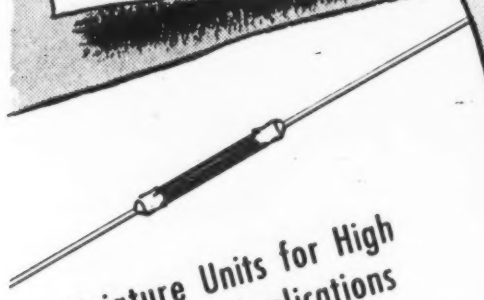

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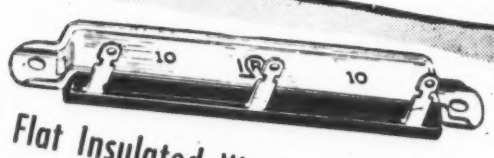

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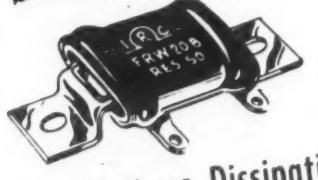

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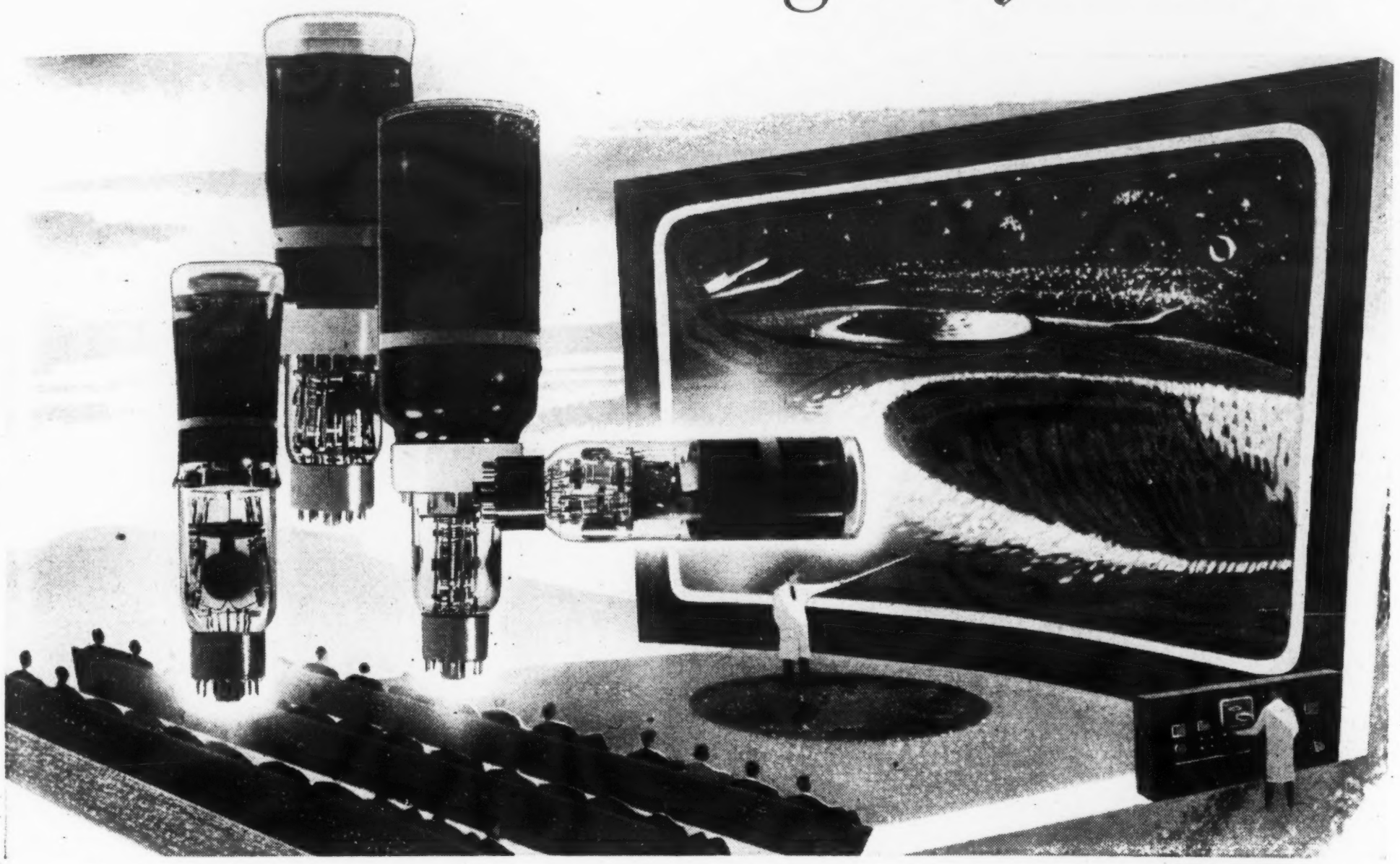

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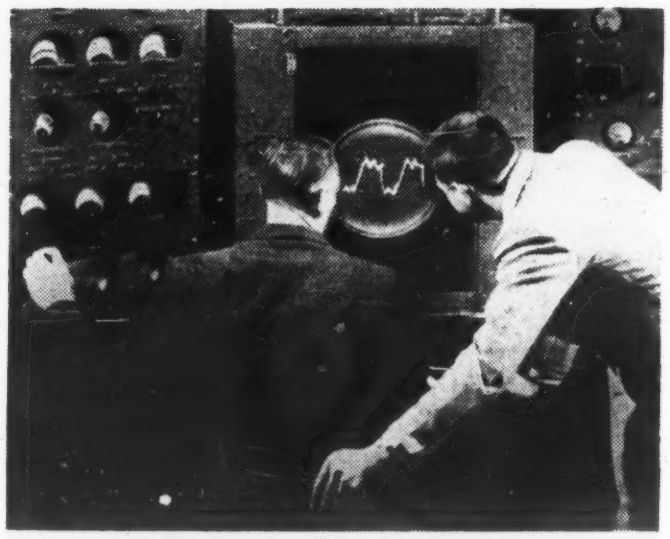

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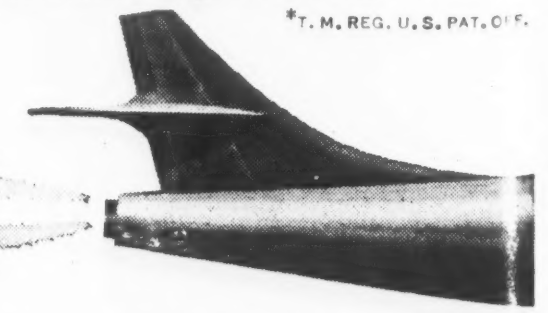

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THE COVER

Aircraft within 40 miles of Washington appear as purple dots on the face of this plotting board in the Radar Control Center at Washington National Airport. Transparent plastic markers show identity and course of each aircraft in the vicinity. See "AIRWAYS — Today and Tomorrow" on page 8 for the story of the Civil Aeronautics Administration's role in guiding the airways to traffic safety.

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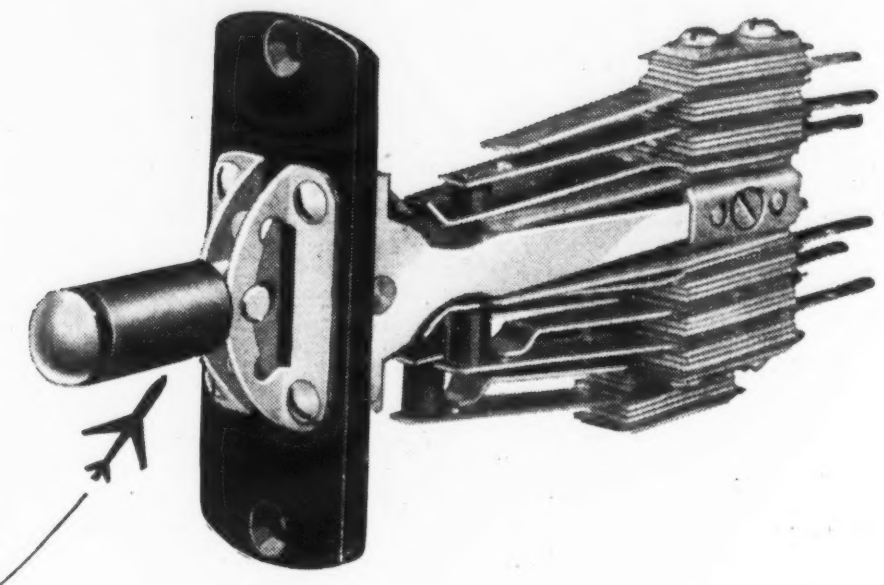

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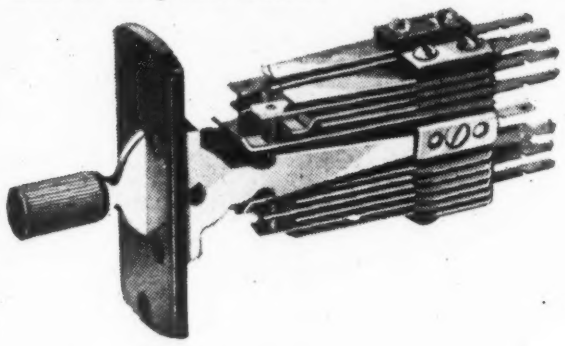
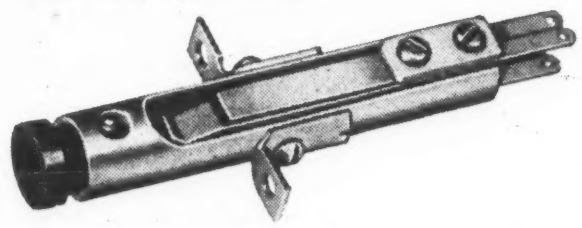
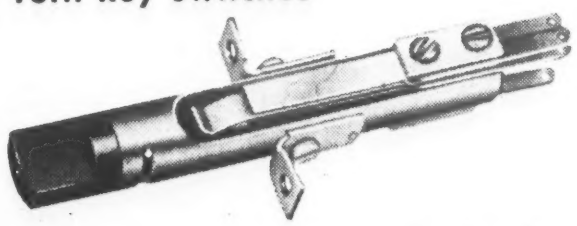
Lever key switches



Push key switches



Turn key switches



These are just a few of the complete line of switching keys available from Automatic Electric. Write for complete details on the correct switch for *your* application.

To guard against the hazards of accidental tripping or extreme vibration (as in aircraft use), choose the "SHOK-LOK" LEVER KEY SWITCH, an exclusive Automatic Electric development.

The "SHOK-LOK" switch is only one of many Automatic Electric telephone-type key switches you can use, handling contact loads equivalent to 115 volts, a.c.—150 watts, NI. Choose from lever, turn or push key types—individual or in key strips—locking, non-locking or interlocking, to meet your specific needs. "Hi-Pot" insulation and low-capacitance springs are available, if you desire. You can mount any of these switches on consoles or on control panels.

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AIR

Today and

The aerial highways which criss-cross the United States—some 100,000 miles of them—are used by military and civil aircraft in common. Day and night, good weather and bad, these airways carry a heavy burden of passengers, of mail, and of freight. Much of this traffic involves men and equipment of the national defense establishments, moving with the speed dictated by the military logistics of the air age.

This is a time of rapid transition and change in the airways system of the United States. New types of electronic navigation aids are replacing the old, and even newer kinds of equipment are in various stages of development and test.

However, no one part of the airways system stands by itself. Radio ranges, communications networks, and traffic control centers, for example, must dovetail in such a way that air traffic flows smoothly and efficiently in bad weather as well as good. This must be accomplished, too, with aircraft which vary widely in their speeds and other characteristics. Our common airways system is used by high-speed military jets, airplanes, cargo planes, and executive and private aircraft.

A low-medium frequency airways system has been standard for a generation. Even before the last war, its inadequacies were apparent, and much research was carried on to produce improved airway aids. Military research produced important new approaches of air navigation, particularly in the field of VHF and UHF pulse techniques, including radar and IFF transponders.

At the close of the war, a wealth of new devices and techniques were available for a new and much-improved airways system. The problem was one of selection and emphases. The components of the new system had to meet a number of basic tests. The mere fact that a device worked was not enough. If airborne, for example, would its weight displace some other useful aid? How much would it cost to purchase and maintain? Is it operationally compatible with other parts of the airways system? How reliable would it be under all weather conditions? Does it place an added burden on the pilot? Is it suitable for use by all classes of aircraft? These are some of the hurdles which new devices had to meet before they were accepted for common system airways use.

The four-course radio range, operating between 200 and 400 kc., was the backbone of our earlier system of air navigation. The relatively low radio frequency used made it vulnerable to static and to other vagaries. Operationally, too, it had important limitations. With only four courses, it was wasteful of airspace. It was monotonous to fly, and the accuracy with which it could be flown depended upon the hearing acuity of the pilot. There was an ever recurrent possibility, too, of considerable confusion between the two "A" and the two "N" quadrants and resultant long delays or reduced safety to flight.

In the new airways system, we have jumped to the 112 to 118 megacycle band for our radio range. Called the omnirange, the new range provides courses in all directions. Its operation is based on the comparison of the phase difference between two radiated audio frequency signals, the difference in phase varying with the change in azimuth. Airborne receivers convert the signals into a visual directional indication for the pilot.

Virtually static-free, the omnirange offers many advantages. With its multiple courses, it provides off-airways as well as on-airways navigational information. It is flexible for traffic control purposes, is easy to fly, there are no quadrants to cause confusion. Reception is limited, of course, to a little beyond line-of-sight. This is no particular drawback to aircraft flying at reasonable altitudes. Line of sight, in fact, has the advantage of reducing interference between ranges operating on the same frequency.

About 365 omniranges are now operating in the United States out of a current program of 414, and 45,000 miles of airways have been established for use by aircraft with omnirange receivers. This compares with about 70,000 miles of low-frequency airways still in operation. As soon as sufficient aircraft are equipped with omnirange receivers and our VOR airways coverage is adequate, we expect to turn off most low-frequency ranges. A basic core of about 70 or 80 will be retained to provide weather information and to furnish instructions to VFR pilots in case of an air raid alert.

In addition to its use in guiding aircraft along the airways, the omni-

RWAYS

nd Tomorrow

Omnirange—basis of new air navigation system. "Derby-hat" houses Omnirange antenna. DME antenna is in "stove pipe" above.

By: Charles F. Horne
Administrator of the Civil Aeronautics Administration

range has considerable promise as an approach and landing aid. We are now conducting extensive tests to learn the limitations and advantages of the terminal omnirange, located on or near an airport. We know that the terminal omnirange is less precise than precision landing aids such as ILS and PAR, but can be used safely down to reasonable minimums at fields where traffic volume does not justify the more expensive precision equipment.

Aviation air-ground communications, like radio ranges, have moved from the low and medium frequencies to VHF, and, in the case of military aircraft, into the UHF part of the spectrum. The chief incentive here has been the reliability of the higher frequencies during thunderstorms and at times when low-frequency communication is almost impossible. In addition to other channels, the voice modulation feature of the low-frequency range has been maintained in the VHF omnirange. It is used for regular weather broadcasts and for traffic control instructions to non-airline craft. Most airline aircraft communicate through company radio while enroute, although the CAA facilities are available for their use if desired.

Newest member of the airways equipment family is Distance Measuring Equipment, or DME as it is called for short. The equipment requires an airborne interrogator, and a ground transponder. By a pair of coded pulses in the 1000 megacycle band, the aircraft transmits a query. This is received by the ground transponder, located at an omnirange site. The ground transponder transmits another pair of coded pulses. This cycle is repeated many times a second. The time required for the "round trip" is translated into miles in the aircraft receiver, and the distance is read directly by the pilot. With the omnirange providing bearing information, and the DME giving continuous distance indications, the pilot has a constant position fix.

DME already has been installed, tested and is now in operation along the very high frequency airway between New York and Chicago. In the next 18 months, more than 400 additional omniranges will be equipped with DME.

Purchasers of the airborne DME equipment will obtain many direct and indirect benefits. Better navigation made possible by a continuous fix will save gas, oil, and flying time. It will permit the pilot to descend with safety after passing obstructions. For the first time, a pilot will be able to fly a controlled *circular* course around the DME station. This procedure, called "orbiting," offers advantages in avoiding thickly-settled areas with resulting reduction in noise nuisance. The possibilities of DME in combination with the omnirange are only now becoming fully apparent.

Radar, developed during the war, has been further improved to meet the needs of the airways. Three types of ground radar are in use by the CAA. Precision approach radar, scanning the approach end of a runway, is used to "talk down" aircraft making a radar approach. Surveillance radar continuously scans a thirty-mile circle around the airport, showing traffic controllers the position of aircraft in the area. It also can be used to control aircraft, avoid collision hazards, and move aircraft into position for approach with the precision radar. This is done, of course, by the controller using voice radio in talking to the pilots involved. The third type of radar, military microwave early warning, is similar to the surveillance radar but has a longer range of 70 miles or more in all directions.

We plan to install 83 airport surveillance radars at the busiest airports, and 52 precision approach radars. Ten of each type already have been commissioned, and many others are under construction or operating on a test basis. The effect of radar is being felt in the high-traffic areas, where it has brought about marked reductions in the amount of delay time.

We often are asked why airborne radar, so useful in military aircraft, has not come into general use in civil aviation. The chief reason is that civil aircraft fly in areas which have good navigational aids, so radar is unnecessary for this purpose. The equipment is still quite heavy, expensive and difficult to maintain in reliable operation. Accurate navigation by airborne radar alone is not easy and is subject to confusion. Eventually, it is possible that the extra weight of the airborne radar will be justified in helping the pilot to avoid thunderstorms and areas of

In a windowless room at Washington National Airport, CAA airway traffic controllers maintain a 24-hour radar watch over aircraft as far as 100 miles away. Each controller can communicate instantly with the pilot by means of voice radio.

By means of airway traffic control centers like this, the CAA directs the flow of traffic along the airways. In congested areas, this system may be superseded by the newer radar center.

high turbulence. Many airline people believe radar has great promise in providing passengers a smoother and more comfortable ride.

So far, we have discussed largely the equipment used to guide aircraft along the airways. With the high speeds of modern aircraft, the letdown and approach to an airport under poor-visibility conditions is a critical operation, demanding very precise guidance for the pilot.

The precision approach radar, mentioned earlier, is one of the aids which permits safe letdowns to the runway under very low ceilings. The other, and older equipment, is the Instrument Landing System, or ILS. We have 110 ILS installations in operation at major domestic airports, and the number will be increased to about 160 by the end of this year.

The basic ILS system is composed of three elements:

A localizer radio course to furnish directional guidance to the airport runway.

A glide slope radio course to furnish vertical guidance down the correct angle of descent to the runway.

Third, markers and other aids to provide accurate radio fixes along the approach course.

The radiated field pattern of the localizer and the glide slope transmitters are modulated at 150 cycles per second on one side, and 90 cycles per second on the other. The localizer operates in the 108 to 112 megacycle band: the glide slope transmitter in the 330 megacycle area.

In the aircraft, the localizer receiver translates the signal into right-left movements of a vertical needle. The glide slope receiver, similarly, actuates a horizontal needle, at right angles to the vertical needle on the same dial. By watching this cross-pointer indicator, the pilot can fly right or left, up or down, as necessary to remain on the correct approach path.

Where both are installed, the pilot can choose between precision approach radar and ILS for his approach to the field. Since the two systems are entirely independent of each other, maximum safety is achieved with an ILS approach which is monitored by a controller watching the precision approach radar scope or vice versa—a radar approach with ILS monitor. If the approach is normal, the controller makes no comment. Should the aircraft deviate from the correct approach path, however, the controller informs the pilot of the deviation.

During a low-visibility approach, the most critical moment is just before the aircraft reaches the runway,

Trailer and antenna system of Airport Surface Detection Radar equipment at Weir Cook Airport, Indianapolis.

and the pilot changes from instrument flying to visual references. In a few seconds, the pilot must be sure he is lined up correctly with the centerline of the runway, and accurately gauge his height and distance from the touchdown. To assist the pilot in this swift transition, high intensity approach lights have proved invaluable.

Almost everyone agrees on the need for the approach lights; but opinions have varied widely as to the configuration they should take. The majority of user groups have shown a preference for a centerline row of lights, extending about three thousand feet beyond the end of the runway and equipped with cross bars to indicate the distance to the runway. Where terrain permits, new approach light installations will be of this type.

The devices touched upon so far comprise the existing airways system. Now let us take a look at some new devices in final stages of development and test, which will soon be available for improving airways operations.

We have on order 52 units of very high frequency automatic direction finding equipment, which will be installed at our surveillance radar locations. In addition, the Air Force has provided us with several additional ADFs for use in locations having special requirements in connection with military flying. Eventually, we hope to purchase additional direction finders for use at communication stations along the airways.

The direction finders serve a dual purpose. Their most obvious use is in locating lost aircraft. Equally important is their use in connection with surveillance radar for identification purposes. One of the problems connected with radar operation is the difficulty of being certain that a particular pip on the scope is properly identified as a specific aircraft. Under present practice, it often

necessary to ask the pilot to make ecial turns and maneuvers to be rtain of its identity. This, of course, time-consuming, overloads com- nication channels, and is inefficient m a traffic control standpoint. The HF direction-finding equipment, as stalled at surveillance radar lo- tions, will paint a thin line of light rough the pip of an aircraft when e pilot opens his microphone on a HF frequency. This will solve most oblems of identity quickly and ef- iently. Equipment installed at com- nications stations will indicate the earing of the aircraft on a simple zimuth dial.

Another device which will much improve the efficiency of radar traffic control is the airborne radar beacon, sometimes called the safety beacon. Surveillance radar, by itself, has limited range and the aircraft pips are sometimes obscured by heavy rain or excessive returns from ground objects. The safety beacon, carried aboard the aircraft, greatly reinforces the pip on the radar screen, and extends the reliable range of the radar.

We are now seeking funds to equip our own CAA aircraft with radar beacons, and hope they will come into general use in the near future. The Air Defense Command particularly endorses general use of the beacons to aid in tracking and positive identification of friendly planes.

At our bigger airports, traffic controllers in the tower often cannot see more than a small part of the airport under low visibility conditions. This, of course, restricts and hampers aircraft movement on the field and also reduces the number of landings, since the controller must be sure the preceding aircraft has cleared the runway before another is permitted to land.

Charles F. Horne

Charles F. Horne, an ex-Navy man who has devoted most of his civil and military life to the business of electronics, communications and aviation, has been Administrator of the Civil Aeronautics Administration, U. S. Department of Commerce, since May 1951.

In 1926, Mr. Horne was graduated from the Naval Academy at Annapolis and began a long career in the Navy which eventually took him up the broad ocean highway from Guadalcanal to Tokyo during World War II. In 1948, while serving as Captain, and Deputy Chief of Naval Communications, he was "borrowed" by the Administrator of Civil Aeronautics to administer the CAA's program of modernizing the Federal Airways system of highways in the sky.

This assignment jibed with his previous experience. The goal was to produce an improved system of airway aids to air navigation and communications which would be usable by all types of air traffic, military, commercial and private. Today this "common" system is approaching the end of a transition period and soon most of the fliers in this country will be using the new Very High Frequency aids, already proved to be much superior to the old Low Frequency aids set up in the late 1930's.

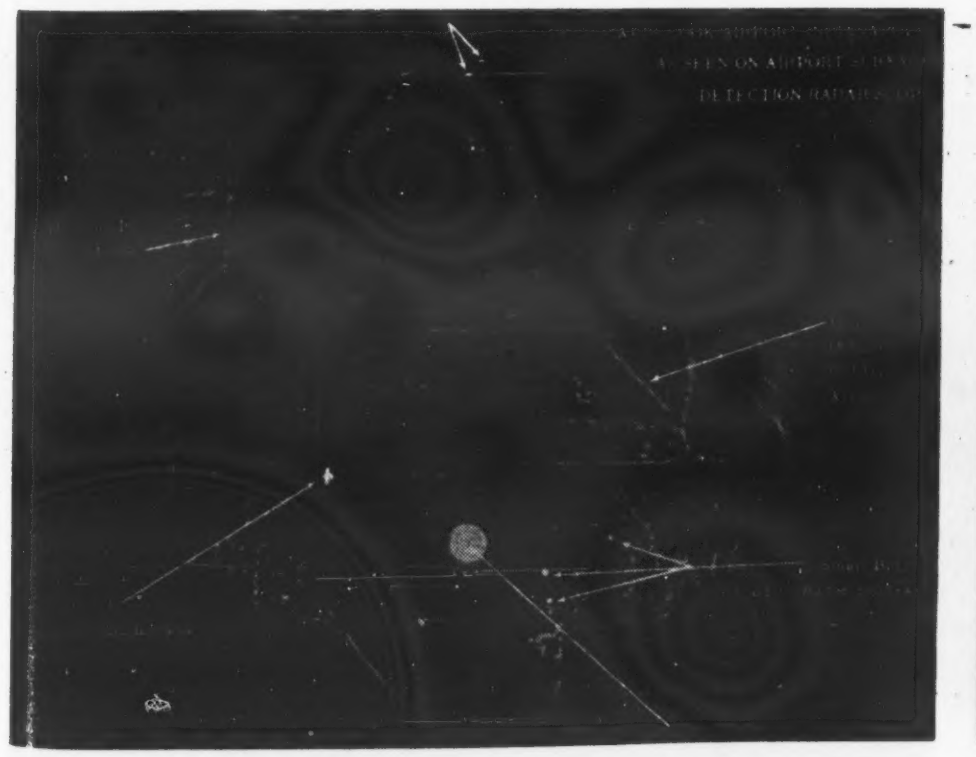
As acting Director of the Office of Federal Airways, Mr. Horne began the actual work of modernizing the airways. As Administrator he continues his interest in this progress while coordinating and carrying out the many duties of the CAA. Mr. Horne voluntarily retired from the Navy as a Rear Admiral, prior to taking the oath of office as Administrator of Civil Aeronautics.

The answer to this problem appears to be Airport Surface Detection Equipment—a short range radar with high definition. The Air Force developed such equipment on an experimental basis, and it has been tested by the CAA at Indianapolis and Minneapolis. It is now undergoing further tests at New York International Airport. The equipment shows aircraft, automobiles, and even human beings over the whole surface of the airport.

During the past year we began operating a Radar Traffic Control Center at Washington, using equipment provided largely by the military services. The purpose of the center is to extend the use of radar to the airways, out beyond the vicinity of the airport. The Center has helped reduce delays to incoming aircraft from an hour or more to a maximum of 21 minutes. Departure delays, in most instances, have been eliminated entirely or reduced to a very few minutes. We hope to go ahead next year with radar centers at New York and Chicago, taking advantage of long-range radar equipment operated by the military services for air defense purposes.

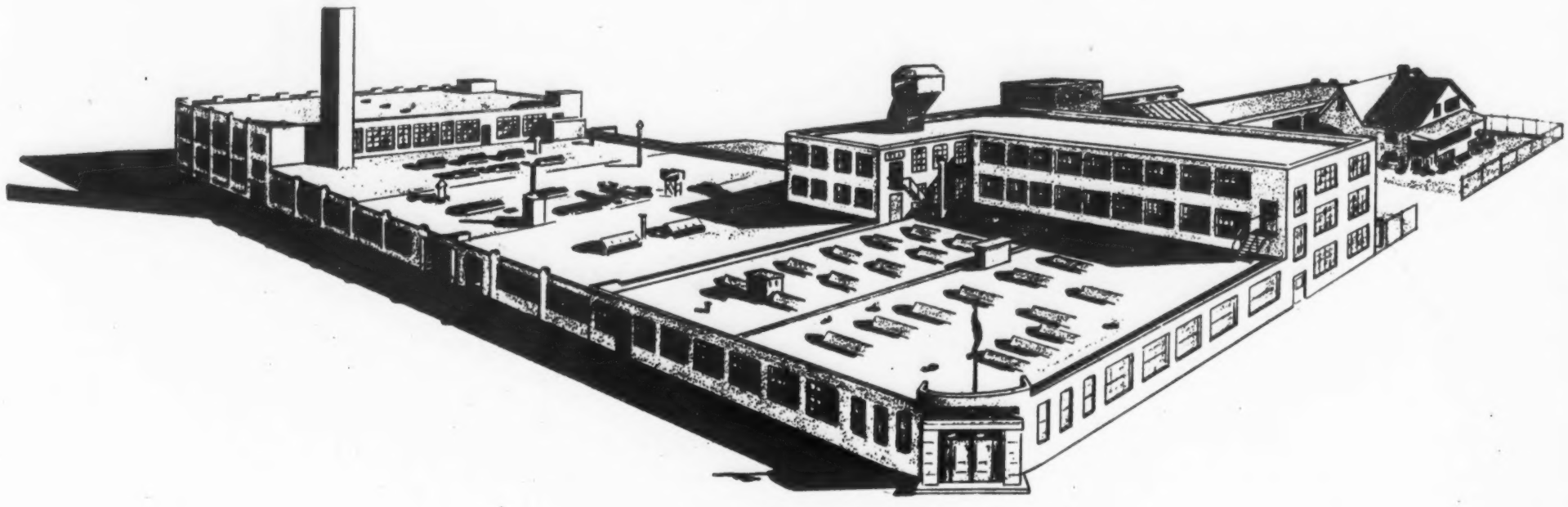
Electronics has changed the airways picture so completely that it would be unrecognizable to the pilot of 15 or 20 years ago. Our airways have grown vastly more efficient, more complex, and necessarily more expensive. We have come a long ways from the time bonfires guided our transcontinental fliers. The next 15 or 20 years may well bring changes of equal or greater magnitude. - - - — - —

Airport Surface Detection Radar Equipment operates in the K band with a frequency of 25,000 megacycles, and provides amazing definition. CAA technicians report that ASDR will show a man walking more than a mile away, even crows that light on the runway.



CAA airport traffic controller "talks down" an aircraft by means of precision approach radar scopes in the tower. Three-mile scope is on the left; ten-mile on the right. The controller, using voice radio, gives the pilot directions for flying his plane to a safe landing.

MACHLETT Electron Tubes



1897 to 1953

Machlett Laboratories, with 55 years of electron tube design and production experience, is a key factor in the development and maintenance of essential activities in medicine, science, in industry and communications and in government. One thousand people, more or less, working in a factory devoted exclusively to electron tubes, produce x-ray tubes—more types than anyone else anywhere — and industrial, broadcast, and communications tubes. Because of the nature of the tube types involved production is of moderate volume and precision construction; as far as is possible each tube produced must function perfectly. To produce electron tubes which meet such stringent requirements Machlett concentrates the techniques of the physicist, chemist, metallurgist, electrical and mechanical engineer into the specialized area of high voltage, high vacuum, high frequency design. In productive partnership with this group are the various manufacturing teams, including glass working craftsmen, trained and accurate parts assemblers, precision machinists and parts fabricators and a long experienced quality control organization.

The Machlett plant, advantageously located in Southern Connecticut, contains within its four acres of work space the fifteen basic production, development and engineering departments, together with general offices and other supporting activities. Adjacent outlying buildings contain packing, shipping and warehouse facilities. Among the departments are a glass fabrication shop in which electrode sub-assemblies and other tube sub-assemblies are produced on glass working lathes—several of Machlett design; a large production machine shop equipped for precision work, a parts fabrication department in which vacuum casting, plastics moulding, hydrogen brazing and many other jobs are done; a complete and fully integrated production unit for high volume production of tube type 2C39A; and a large area for the manufacture and testing of high priority hydrogen thyratrons. For the most part only raw materials are purchased; practically all the component parts of Machlett built tubes are fabricated in the Company's Springdale plant.

One seemingly simple requirement broadly affects the entire manufacturing process. The internal tube parts must be so clean that no surface contamination or surface-trapped gas remains to be released by the high temperatures and other conditions associated with operation at high voltage and high power levels. Heat-freed gas impairs tube vacuum; without essentially complete evacuation a high voltage electron tube is either unusable or is unstable and fails early in life. Continuous, precise control over highly complex manufacturing processes is the price paid to assure the maintenance, throughout long life, of the best possible vacuum conditions.

Precision control begins with the raw material. Copper, nickel, tungsten, tantalum, beryllium and a variety of other metals used must be chemically pure and physically clean. Steels alloyed for ease of machining cannot be used, or must be used with the greatest care, because tube contaminating gases are potentially present to be released during tube operation. Impure nickel under oxide coated filaments drastically reduces filament life by poisoning the emissive coating. Tube glasses must be chosen for expansion and radiation absorption characteristics; each tube uses several kinds of glass. For all incoming materials one hundred percent inspection and testing is the rule.

Both production and equipment are complicated by the need to op-

erate in many "dimensions." As examples, consider the glass working lathes, then the vacuum casting process. At first glance the lathes appear to be woodworking machines installed by someone with a predeliction for complicated plumbing. Each lathe has associated with it several color coded pipes, valves and gauges. The pipes contain, of course, heating and protective gases used in softening and working the glass. Nitrogen, fed through the turning center of the lathe, is used to prevent condensation on the inner glass surface and to keep the metal electrodes, embedded in the glass being worked on, from oxidizing; the gas pressure keeps the heated glass from losing shape. A mechanical consideration of great importance is the fact that the turning power cannot be transmitted through or between the turning centers. The glass being shaped would when hot, twist and distort if it had to carry this torque. The lathe supplies power to both chucks and these must run in unison, with a minimum of backlash, or stresses in the glass, sufficient to disqualify a tube, would occur.

Pure copper is vacuum cast, in many complex forms, and to precise dimensions, by induction heating. In this process a crucible made of graphite holds a copper charge and mold. The crucible and contents are placed in a long cylindrical quartz jar which is sealed during operation. The jar is contained in heat-resistant glass. A high vacuum is maintained in the quartz jar; cooling water is circulated between the glass and quartz; a high frequency coil is energized, the crucible heated and the copper melted by conduction. The quartz jar is used to re-radiate the crucible heat back to the crucible. Sensitive vacuum gauges register the amount of contaminating gases released by the molten copper. The copper is kept liquid until all signs of gas disappear. The casting is then cooled, through a predetermined schedule, so as to produce a dense, non-porous copper form.

This essential attention to detail is carried far in the tube assembly area, air conditioned with humidity and dust control. The personnel wear lint free white jackets and gloves and work at white benches. Bench surfaces are covered with clean paper. Materials are transported in small glass pans each of which has a fresh paper lining. White cabinets containing trays of dehydrating chemicals to keep the air dry are used to store assembled parts and parts awaiting assembly.

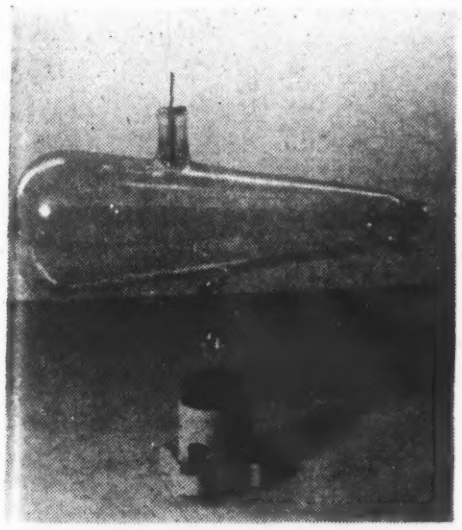
Final pumping of the tubes is the most vital, and one of the most difficult to define quantitatively, of all the manufacturing operations. In tube manufacture a "vacuum" is a "condition" to be maintained over the entire operating range of any tube. The "condition" refers both to the absence of molecules within the glass envelope and to the absence of occluded gases in the component parts, metal, glass and ceramic. Occluded gasses are found on the outer molecular layers of the surfaces of the tube parts; these gasses can be removed only by simultaneous heating and pumping. The degree to which both types of gas are removed depends on the type of tube being produced. The higher the operating voltage or temperature the greater the need for approaching a complete vacuum, and the closer this approach the more expensive and difficult the job. Because of outgassing — or pumping—necessary; and because of the use of chemically pure material, a high voltage electron tube of fine manufacture is clean inside—cleaner than any other device made today.

During the final pumping tube atmosphere is reduced to the point where a standard column of mercury would be raised about one ten-millionth of an inch or a little less than fifteen ten-millionths of an atmosphere. Three separate operations complete this process. The first heats the glass of the tube envelope to just short of its softening point. This bakes out the glass surface gasses. Next the electrodes are heated almost white hot by induction coils and the gases remaining from previous degassing of the electrodes are moved. Finally the electrodes are connected electrically and run at voltages and currents in excess of the maximum operating conditions. Tubes are operated in a lead lined enclosure to protect the operators from x-ray radiation. (X-rays result from any electron bombardment but x-rays of penetrating power result only when sufficiently high voltages are used.) During the high voltage operation the tubes flash arc inside—that is, voltage sparks jump from one electrode to another—until the metal surfaces are cleaned up by the pumping out of contaminating molecules vaporized by the sparks and heat. When the arcing has been reduced to an allowable degree the final pumping cycle is completed, the tube is sealed and sent to electrical test.

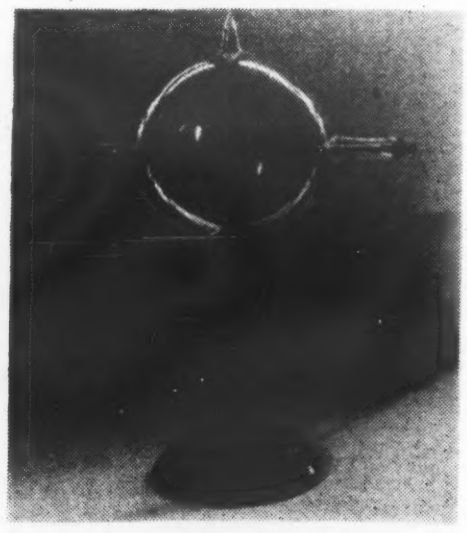
Keeping high voltage under control demands unusual complexities of manufacture and it demands, too, the hidden precision of the eye and hand of the glass worker. Glass working for high voltage electron tubes is still essentially a craft technique. Mass production machines cannot supply the equivalent of the glass worker's feel for his work. The men and women at the glass working lathes at Machlett's have worked at their jobs for many years and they have developed an intuitive skill in the exercise of their function. When the

Early Machlett tubes now located in the Army Medical Museum Collection of the Army Institute of Pathology, Washington, D. C.
Photos Courtesy Army Institute of Pathology

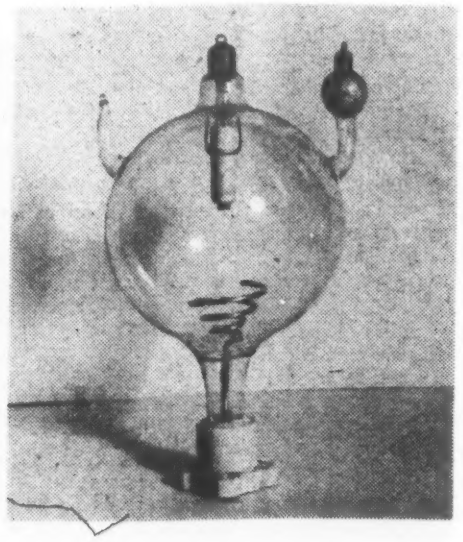
a. Crooke's Tube; made in 1898.



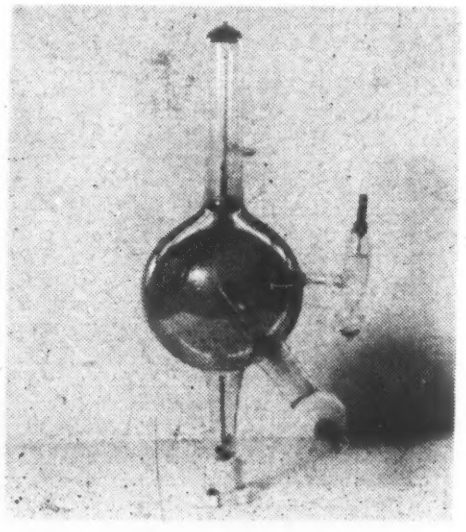
b. Experimental glow tube; made in 1905.

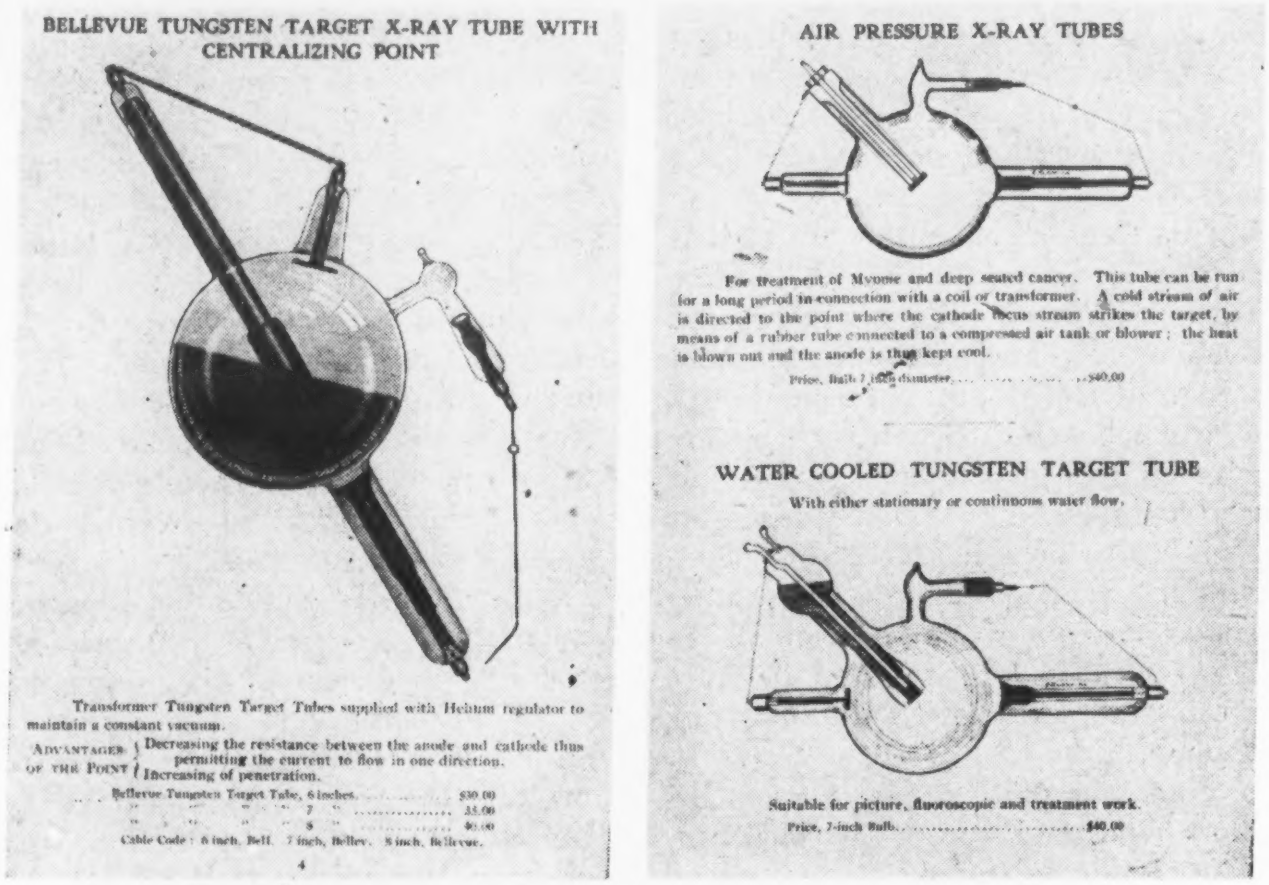


c. Gas rectifier tube; made in 1905.



d. X-ray tube with watercooled anode; made in 1907.




BELLEVUE TUNGSTEN TARGET X-RAY TUBE WITH CENTRALIZING POINT
Transformer Tungsten Target Tubes supplied with Helium regulator to maintain a constant vacuum.
ADVANTAGES OF THE POINT
Decreasing the resistance between the anode and cathode thus permitting the current to flow in one direction.
Increasing of penetration.
Bellevue Tungsten Target Tube, 6 inches $30.00
" " " " 7 " 35.00
" " " " 8 " 40.00
Cable Code: 6 inch, Bell. 7 inch, Bellev. 8 inch, Bellevue.
4
AIR PRESSURE X-RAY TUBES
For treatment of Myome and deep seated cancer. This tube can be run for a long period in connection with a coil or transformer. A cold stream of air is directed to the point where the cathode focus stream strikes the target, by means of a rubber tube connected to a compressed air tank or blower; the heat is blown out and the anode is thus kept cool.
Price, Bulb 7 inch diameter $40.00
WATER COOLED TUNGSTEN TARGET TUBE
With either stationary or continuous water flow.
Suitable for picture, fluoroscopic and treatment work.
Price, 7-inch Bulb $40.00

Pages from the 1914 catalogue published by E. Machlett and Sons. Other catalogues were published in 1907 and earlier.

color is "just right," when the glass is "just soft enough" and when the seal has been worked "long enough" —these are of the undefinable province in which this hidden precision is a part. With the exception of one tube type all Machlett tubes pass through the lathes of these glass workers.

Every Machlett tube sold has a filed record of testing and pumping, a record begun as soon as a tube is assigned a serial number. The final evaluation of the tube consists of radiographic tests for electrode alignment and electrical operation under simulated load conditions. A tube with misaligned electrodes may test all right electrically but will probably have a less than maximum life.

Through all these procedures the individual tube is accompained by its record card. Behind the record card and the final test lie numerous inspections. An average Machlett tube receives 121 inspections during its construction. Tube test and inspection provide the background for field inquiry and liaison. Since serial numbers and dates of manufacture

Sealing glass envelope of a power tube at Machlett laboratories. Tube elements are sealed in their glass envelopes on glass working lathes. The senior members of this department have a range of from 12-19 years of glass working experience at Machlett's.

are filed permanently and records are kept for many years practically any question regarding a tube can be answered. This is a necessity in an organization which feels that even one tube failure is too many, and which considers it essential to maintain adequate records to determine whether field failures result from tube operating conditions or tube design and construction.

MACHLETT MARKET AND TUBE DEVELOPMENT

The Machlett market covers the medical, Public Health, scientific, industrial, military, communications and broadcasting field. Medicine uses x-ray for diagnosis, therapy and research. Industry uses x-ray for testing, gauging and research and uses power tubes for radio frequency heating and electrostatic precipitation. Scientific work includes both types. Broadcasting and communications use power tubes for AM, FM, and television transmitters. Machlett tubes are exported to almost every country in the world, and, in England, an affiliated organization manufactures for the British and continental market.

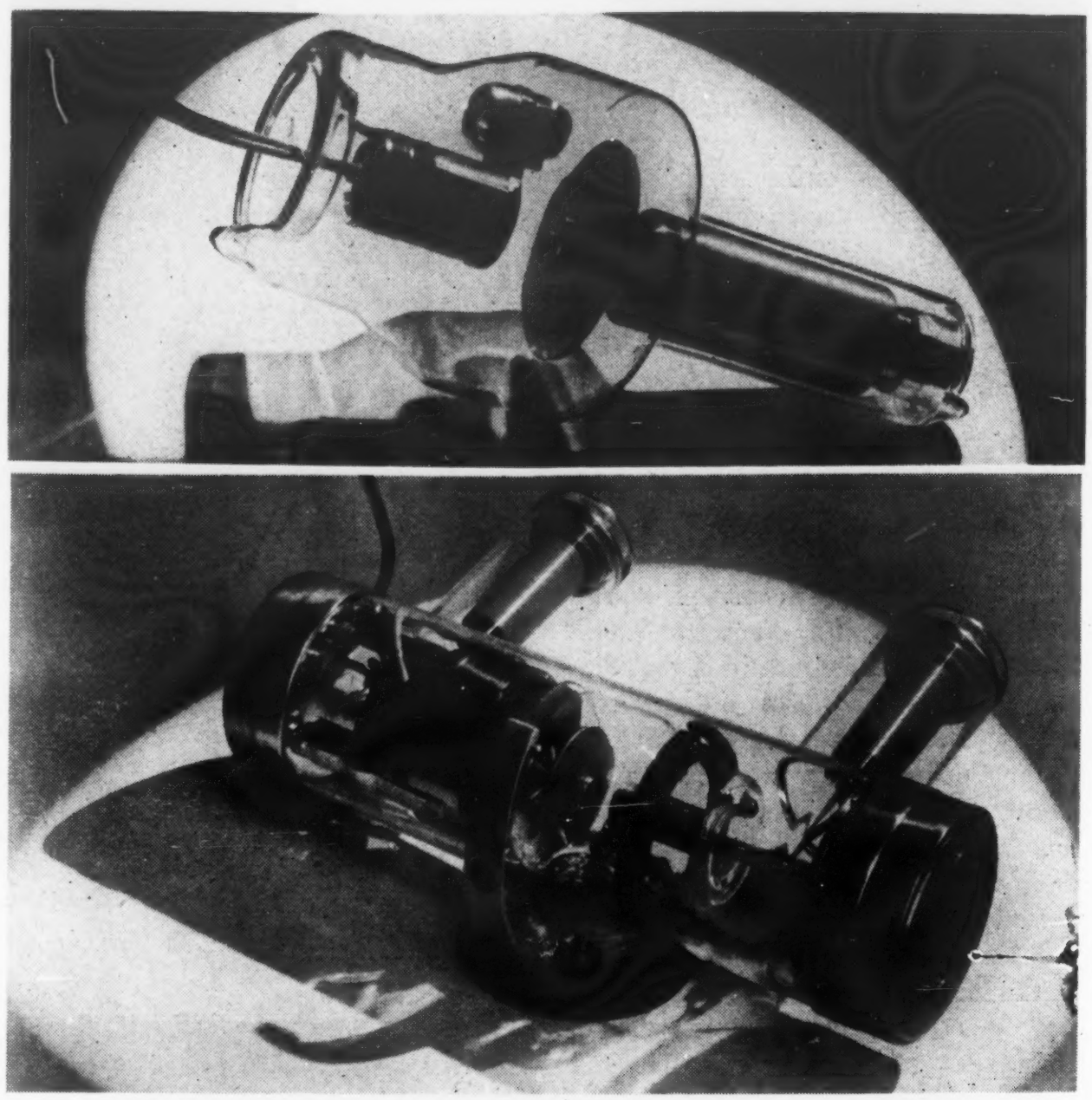
The many x-ray types made range widely in design. The tubes vary in operating voltage from 5,000 peak volts for Grenz ray therapy to the Betatron's 24,000,000 electron volts for deep therapy and cancer research. The bulk of production lies in the 25,000 to 260,000 peak volt range. Radiation characteristics run from deep penetrating rays for long exposure radiography to shallow penetration, high intensity emanations of wide industrial and scientific application. Of all the x-ray tubes the most widely recognized and used are those of the Dynamax series of rotating anode tube, now used for day in day out x-ray diagnosis of almost all kinds. The Dynamax is used for public health chest surveys in hospitals and travelling field installations and has been a primary factor in combating tuberculosis; the tube is standard equipment in U. S. military field installations.

It was a Machlett discovery that changed the status of the rotating anode from a laboratory instrument to that of a working medical tool. The rotating anode tube was made practical when it was found that silver coated steel ball bearings would work satisfactorily under the conditions of high vacuum and intense heat. Previous to this no bearing lubricants had been satisfactory

Rotating of the anode permits the electron stream from the filament to be spread over the entire perimeter of the anode disc, in this manner allowing high working energies. Because of this improved control of heat dissipation x-ray picture requirements could be more demanding and more pictures could be taken within a given time. Both of these gains depend on rapid removal of heat away from the focal point of the electron stream. Since x-ray photographs are shadow pictures the closer the x-ray of "light" source approaches a pin point the clearer will be the picture. The more the rays are pin pointed, however, the greater becomes the problem of heat distribution since greater energies are concentrated in smaller areas. The rotating anode made possible the reduction of focal spot size, increased energies and improved picture definition. Since heating conditions were less severe the anode could be actuated more frequently and more radiographs made. With the rotating anode type patients can be radiographed as rapidly as they can be prepared for the x-ray machine.

Early in the 1940's Machlett metallurgical research perfected a form of beryllium for use in x-ray tubes. With this beryllium, x-ray ports, or windows, could be made to transmit long-wavelength rays, rays usually absorbed by other materials. From this one design advance came a new group of tubes and many new and important applications in thin section radiography, or x-ray photography of sections of two ten thousandths of an inch to a little over a quarter of an inch in thickness. Cancer research uses beryllium tube techniques for investigation of cell composition. Testing of aircraft welds and high speed thickness gauging are industrial applications. The F.B.I. uses the tubes in connection with x-ray spectrometers for chemical analysis of rare, hard to get, bits of evidence and the National Gallery of Art in Washington, D. C. has built a special machine to use the tube for the examination of oil paintings to determine the procedure and technique of the artist as well as to determine either the condition or authenticity of a picture.

Machlett electron tubes — high power and high frequency oscillators, amplifiers, modulators, high-vacuum rectifiers and special purpose tubes— are used in a diversity of commercial and government electronics applications. Many of the types in this broad line of electron or so-called "power" tubes are original Machlett developments or are electrically and mechanically improved versions of existing types of tubes.



Above: Rotating anode x-ray tube. These Machlett Dynamax "inserts" produce the x-rays that make the x-ray picture.

Below: Plastic model of x-ray housing showing how insert fits in housing. Stator windings for anode motor are shown placed around glass housed rotor. Entire interior of head is vacuum filled with insulating oil of highest purity and dielectric strength.

The fields of aplications for these tubes include: induction and dielectric heating by industry; commercial AM and FM broadcasting; high-power broadcasting by government services such as the State Department's Voice of America, the Bureau of Standards' Radio Station WWV and the CAA: television broadcasting; ship-to-shore and overseas radio telephone; ultra-high frequency Air Force and Signal Corps communications; electrostatic precipitation of fly-ash, smoke, catalysts and chemicals by power companies, factories, refineries, and chemical plants, respectively; research projects and oscillators of cyclotrons; radar equipments; high-power and high-frequency electronic test units; and still others under development.

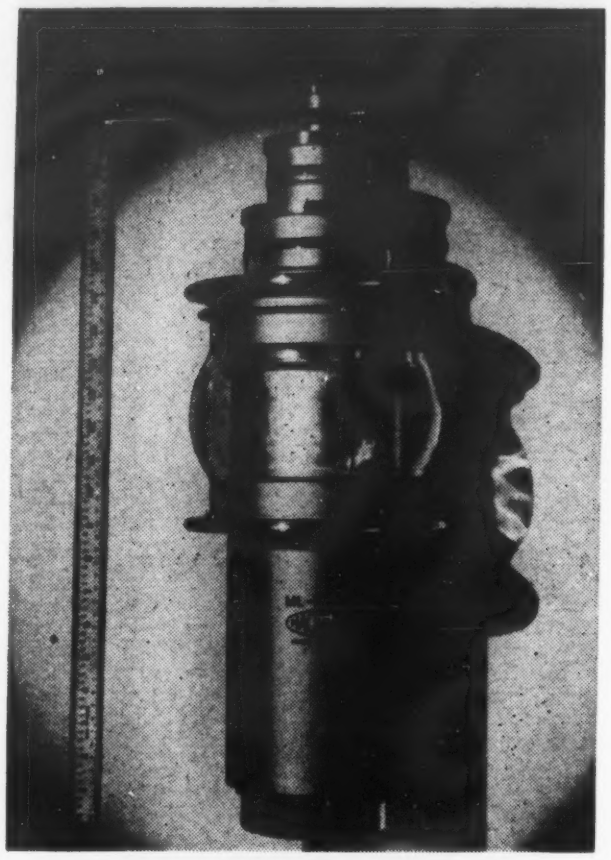
Continuous pumping apparatus. Tube on movable dolly (left) is about to enter bake oven for high temperature exhaust. Center station shows tubes being pumped while internal electrodes are heated by high frequency current. Final stage, far right, shows lead lined room in which tubes are pumped during high voltage operation.

The success of many of these applications is due in great measure to the availability of specific types of Machlett tubes incorporating design considerations required by the intended class of service.

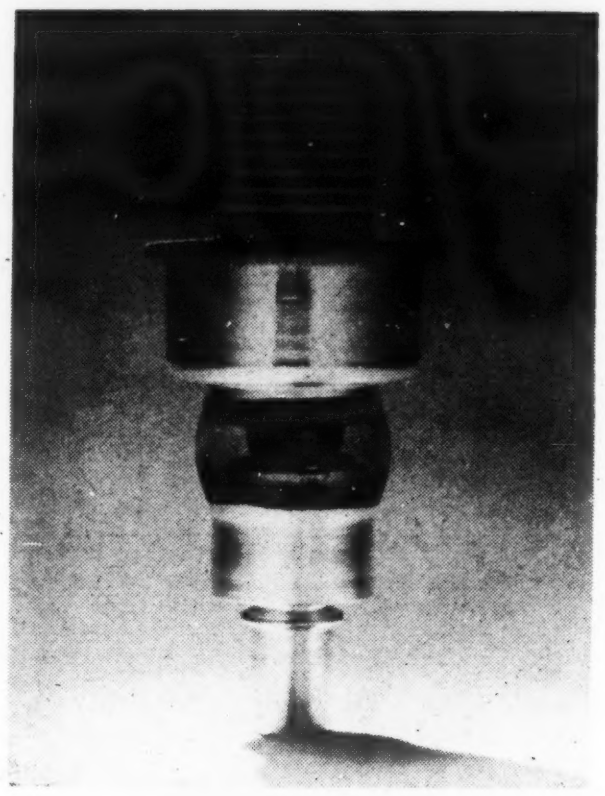
In the radio-frequency heating field —both induction and dielectric— there were until just after World War II only broadcast types of tubes available to industry. Users as well as manufacturers of r.f. heaters were experiencing the shortcomings of radio transmitting tubes being used by industry. Machlett Laboratories studied the problem with interested equipment engineers and users and established design considerations for electron tubes capable of meeting the severe electrical and mechanical conditions of industrial services. As a result of a definite program Machlett now makes available a line of heavy duty industrial tubes—with sturdier glass to metal seals and electrode mountings, stress-free long-life filaments, thick-wall anodes, and preferred electrical characteristics — for single-tube induction and dielectric heaters rated for 2 through 150 kilowatts output. Many of these tubes are used by the automotive and aircraft industries, machine and cutting tool concerns, instrument and office equipment manufacturers, appliance makers and others for induction hardening, annealing, brazing, and soldering metal parts and components. Industrial tubes in these applications have reduced maintenance and production costs by improving performance and minimizing early failures and shutdown periods.

For dielectric heating applications —particularly for the quick-setting of glued joints and furniture, plywood, cabinet, and other manufacturers in the woodworking industry—high frequency industrial tubes have made possible electronic equipments for complete glue-curing in wood-bonding within one minute compared to 30 minutes glue-heating in ovens followed by nine or more hours glue-drying. In the plastics industry, to give an additional example, Machlett tubes are also the heart of equipments which make possible compression molding of large TV and radio cabinets and other plastics items of thermosetting phenolics in five minutes compared to over double this time by other means of heating.

The communications and broadcast market finds extensive use for Machlett power tubes, both industrial and broadcast types. The latter include many of those once made by the Western Electric Company. When Western Electric decided to turn its energies toward the supply of the Bell Telephone System, plus certain government requirements, Machlett was selected to continue the production of their broadcast and communication tubes. Today these Machlett-made tubes fill many important positions, including the principal transmitting types for the overseas telephony operations of the American Telephone and Telegraph Company.



The ML-5682, Machlett's largest communications-industrial triode. Concentrically aligned, gold plated ring seal terminals and thoriated tungsten filament maintain stability and power at very high frequency and high power levels.



The ML-2C39A planar triode — the smallest tube Machlett makes. Tube operates up to 2500 mc and is produced in high volume for military service, CAA air navigation systems, telemetering installations and so on.

An outstanding broadcast application of a Machlett-developed tube is that of the ML-5682, a high power ring seal triode used in the final stages of the new "super power" 1000 kilowatt Voice of America transmitters. Each transmitter consists of two separate and complete 500 kw sections each using one oscillator of either unit to drive the remaining stages of both 500 kw units. The output of each is fed into a phasing bridge device to create 1000 kw at the terminals of the transmission line. A further non-industrial use of the ML-5682 is found in the newly developed high power television transmitters soon to be placed in service. For conventional AM, FM, and television broadcasting Machlett supplies many of the needed power tube types for installations in this country and abroad.

Government services are supplied with high power tubes for use in radiotelephony and radiotelegraphy. In connection with these applications Machlett quality was given recognition when the Navy together with the Bureau of Standards and the U. S. Signal Corps obsoleted the standard 889RA in favor of the Machlett designed and produced ML-5667. For ultra high frequency operation the ML-2C39A planar triode finds wide use in aircraft communications, navigational devices and radar. Hydrogen thyratrons for special government uses are now being tested and produced.

This brief review indicates the scope and importance of the products of a company privileged to find itself the supplier of key electron tubes for key uses in the national economy. It is Machlett's confident assumption that the maintenance of the high standards of its products—standards based on tube building experience of 55 years—and the diversity and usefulness of its tube designs will find the company vigorously involved in a future in which, even more than now, electronics will be basic to all phases of our national activity.

Communications Executives

the Air Force trains its own

By: Lt. Colonel Milton Frank, Jr.
Instructor, Communications-Electronics Staff Officer School

"We're training communications executives."

That was my answer to an official of a major electronics and home appliance corporation who had asked: "just what are you really doing at the U. S. Air Force Communication-Electronics Staff Officer Course at Maxwell Air Force Base?"

"Our 'executive training' for communications-electronics officers is very similar to the 'Home Office Executive Training Program' your corporation provides for selected men," I explained. "As I understand your program, you look over your world-wide operations and recognize men who are, perhaps after eight or ten years with the corporation, ready to be broadened so that they might assume even higher and more responsible positions. Most of these men have spent their past years with the corporation in one of its many specialized areas: home appliances, air conditioning, industrial products, research, purchasing, etc; each has attained a position of management within his field. These men, I am told, are brought into the home office for executive training. They are given training in company policies—personnel, government relations, public relations, management—and in the operations of all the types of businesses the corporation conducts. (And with which these men, up to then, have had only cursory association.) Upon completion of the training, your corporation expects these men to be able to assume senior staff or management positions anywhere within the corporation, with only brief orientation periods required."

"The Air Force 'home office' executive training for senior communications-electronics officers is conducted at Maxwell AFB by the Communications-Electronics Staff Officer Course. Using a procedure similar to that used by your corporation, the Air Force looks over the field and selects for attendance at the 'CE-SOC' communications-electronics officers who have had from eight to ten years service. A typical officer student is either a Major or Lt. Colonel who, most likely because of the specialized requirements of the war years, has spent most of his service in one of the communications-electronics specialized areas: classical message communications (radio, telephone and telegraph), airborne or ground radar, electronics counter-measures, or security. He may have specialized within one of these task areas—in operations, maintenance, procurement or research and development. In any of these specialties, he may have been a staff officer or commander. However, once at the CE-SOC he joins with approximately 60 other officers for five and one-half months of executive training. This training, as outlined by Air Force Headquarters, is to fit him for '. . . communications-electronics staff duties at the wing and higher level, and for command of communications-electronics units.' "

The CE-SOC is the highest level communications-electronics staff course offered within the Air Force. It is not, as many former Air Force personnel have assumed the "new Scott Field Course." (The "old" Scott Field Course, and its temporary counter-part at Yale University, trained military personnel and civilians to be Communications Officers under the World War II Aviation Cadet Program. A modified Scott Field Course exists today at Scott Air Force Base, Belleville, Illinois. The temporary Yale course, after taking care of the overflow during the build-up period of the war, was discontinued.) The differences between the Scott course (of World War II and today) and the CE-SOC are primarily those of level and scope. These differences relate directly to the differences in the training offered by the Air Training Command and the Air University Command. A brief digression to look at those differences will help to clarify the role the CE-SOC assumes within the Air Force training program.

The Air Training Command provides fundamental training for Air Force personnel. Air Training Command courses may be said to be vocational, designed to qualify personnel in the wide variety of technical skills. Pilot training, airplane mechanic training—and the initial communications-officer training at Scott AFB—for example, are within the scope of the Air Training Command. Other communications-electronics courses of the Air Training Command include Ground and Airborne Radar, and Electronics Countermeasures courses for officers; Wire and Cable Splicing, Teletype Maintenance,

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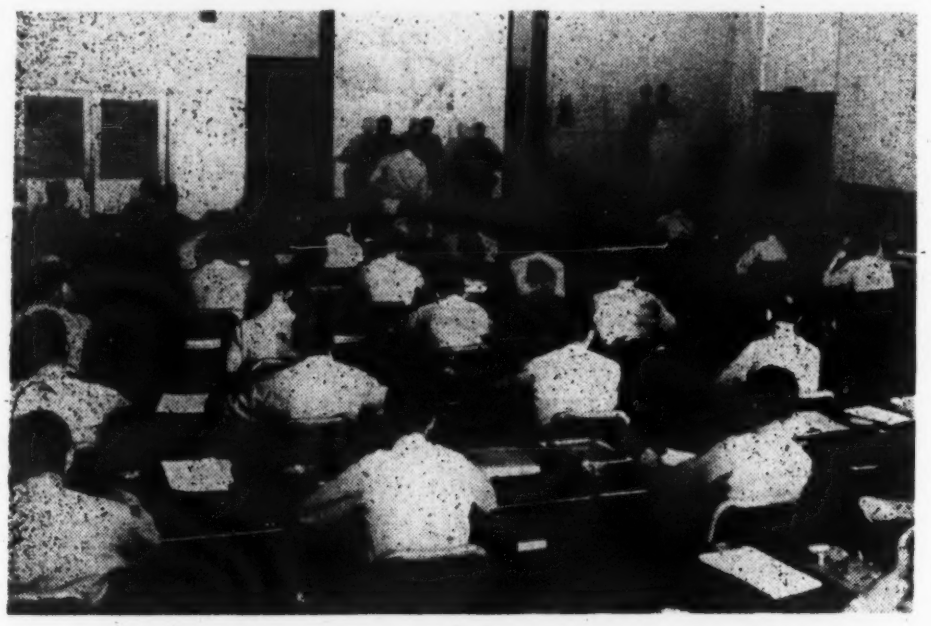

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From this general philosophy have been drawn the course objectives. Those objectives, as described in the Course Curriculum, have been designed to develop the students' ability:

a. To understand the role of communications-electronics in the Air Force.

b. To advise their commanders on all matters pertaining to the most effective use of the latest communications-electronics devices and techniques.

c. To assist their commanders in developing plans and policies for the Air Force, and for joint and combined air operations, so as to exploit fully communications-electronics devices and techniques.

d. To understand and advise their commanders on the interrelationship between military, non-military governmental, and commercial communications-electronics matters.

e. To participate in communications-electronics policy and planning conferences and committees as representatives of their commanders, the Air Force, or the United States Government, whether these conferences and committees be intra-Air Force, joint service, inter-departmental, or international.

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"a. Communications-electronics doctrines, plans, policies and principles.

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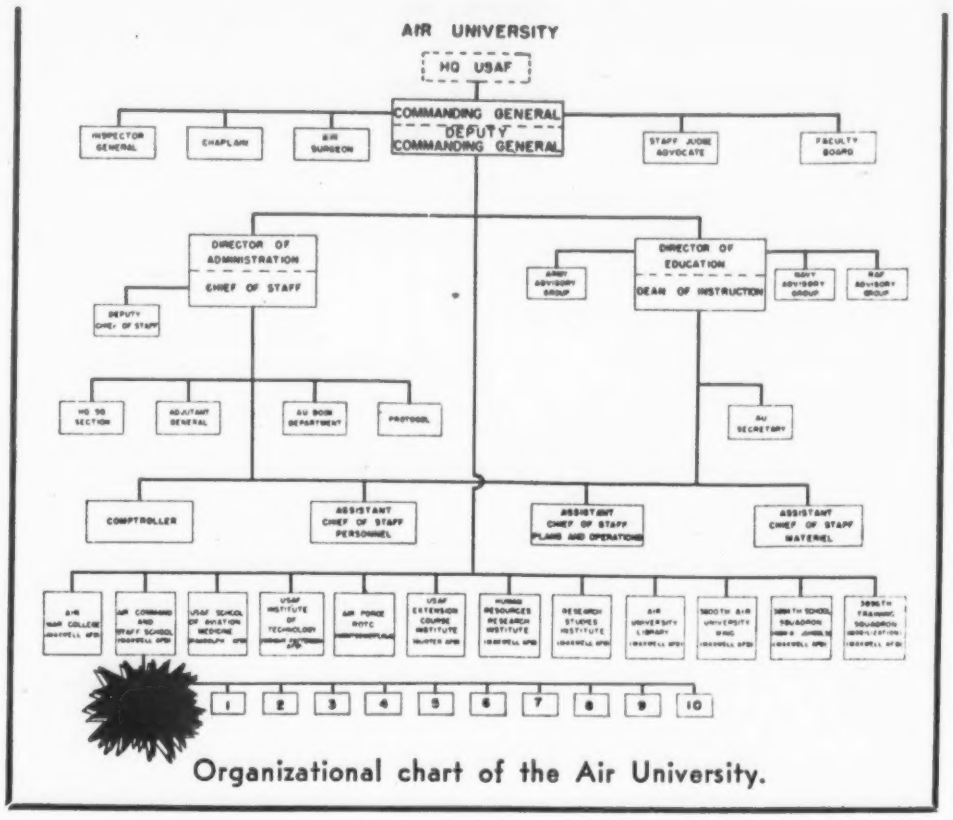
As one would expect, a wide variety of instructional methods are used to put across so great a scope of material well and interestingly. The instruction is presented by lectures, forums, briefings, panels, exercises, problem solving meetings, and field trips to military and industrial training, research and manufacturing installations. Within this variety of instructional methods, even greater diversity is obtained, from the students' standpoint, by the numerous sources of instructions from which we draw. Generally, these sources include our own faculty (twelve full-time instructors, all senior communications-electronics officers), the faculty of the other Air University courses, and guest lecturers from other Air Force units, military agencies, governmental agencies and from civilian industry.



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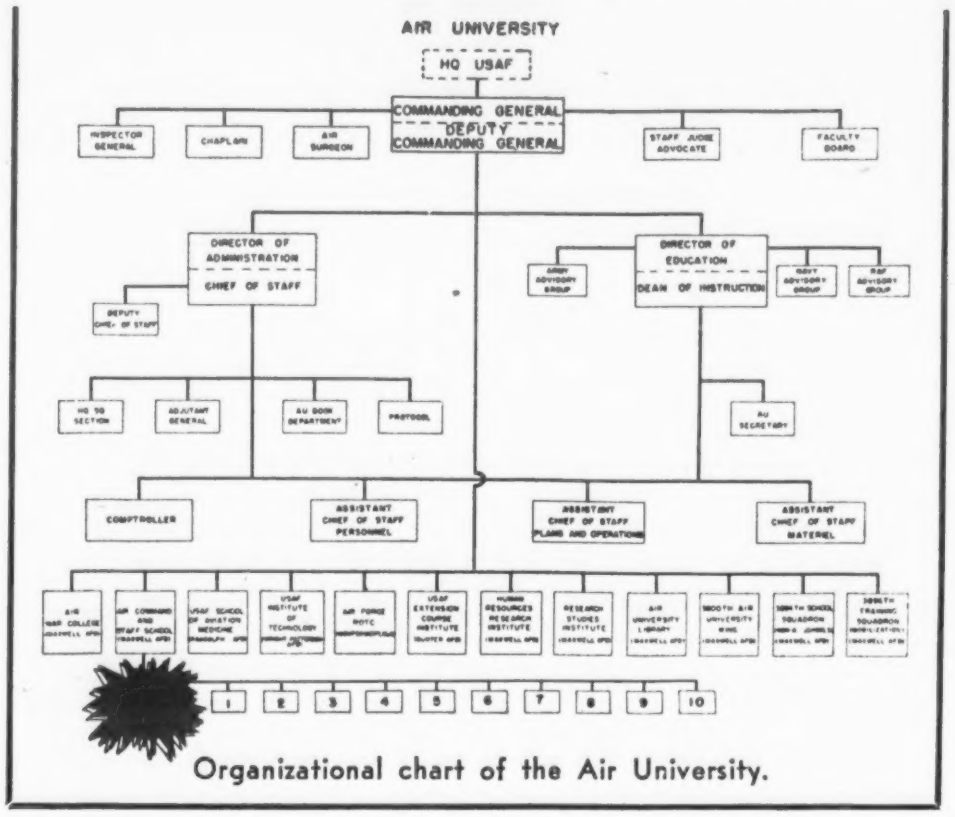

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MR. PRESIDENT, AND MEMBERS OF THE NEW YORK CHAPTER OF THE ARMED FORCES COMMUNICATIONS ASSOCIATION

AT the outset, let me assure you that it is both a pleasure and an honor to appear before this distinguished group of communications and electronics experts and to be afforded the opportunity of saying a few words regarding communications and electronics philosophy in the Army today. I hope that what I have to say may serve to strengthen the bonds of friendship and mutual high regard that have characterized the relations between industry and the Armed Services. Indeed, the latter is one of the important objectives of the Armed Forces Communications Association.

Recently I have been privileged to visit several commercial and institutional electronics and communications laboratories for the purpose of gaining some idea of what is being accomplished in the research and development field electronics- and communications-wise. As I listened to the briefings presented by distinguished scientists and engineers, I could not help but reflect on the tremendous advances in the field of electronic science and device application since World War I. These advances have indeed been phenomenal. Characteristic of such a young, vigorous, and imaginative science, there have been temporary blocks in progress, followed by technological breakthroughs of such force as to push the horizon of electronics beyond our most optimistic expectations. And what is perhaps more heartening to one whose major responsibility is military electronics in the broadest sense—there is abundant evidence that the growth of our science is continuing unabated.

Much of the present advance in electronic research and development is traceable to the momentum generated during World War II. Radar, for example, was one of the greatest developments of that war. Radar had started with relatively low frequencies and then moved slowly into the microwave regions. Then, the great technological break-through came with the invention of the cavity magnetron as the result of work inspired by a grave national crisis. The availability of megawatts of microwave power transformed radar from a solely defensive weapon into one of great effectiveness in offensive operations. Radar and its many subsequent electronic derivatives opened the floodgates and launched this country into a fabulous electronic wonderland.

In spite of the magnificent contributions during World War II, I have the feeling that electronics has not yet been called upon to really flex its technological muscles in a modern war. I hope that this will never be necessary. However, if the potentialities for protecting our nation are to be realized there remains the important and very sensitive job of matching the demanding requirements of our Armed Services to the present capabilities of our electronic technology.

Neglecting for the moment considerations of sheer manpower, the military might of a Nation may be measured in three dimensions—mobility, fire power, and industrial potential. The increased mobility of our forces results from modern transportation methods, but the necessary long range control and coordination of highly mobile forces is a problem in radio and wire communication control systems. Increases in fire power result from advances in the field of weapons. But the accuracy of fire and the speed with which fire may be brought to bear on a target are enhanced immeasurably as the result of radar detection and locating devices, computers, servomechanisms, and communications systems.

Our industrial might is based largely on mass production methods, but here again electronics plays a prominent role in the communications systems of the country, the control of transportation, the use of electronic computers, and the operation of automatic

Electronics Army

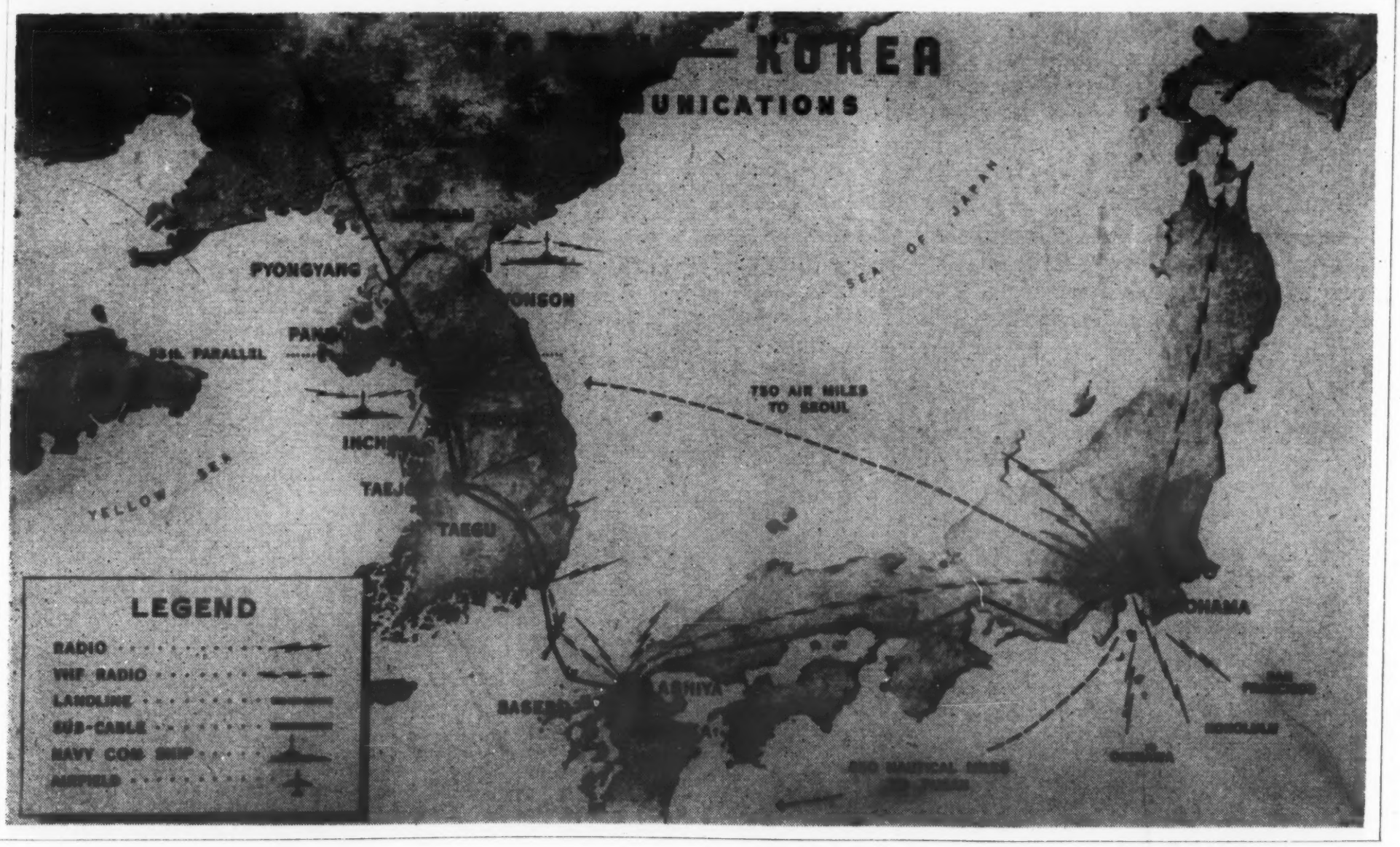
By: Maj. Gen. George I. Back, U.S.A.
Chief Signal Officer

machines and factories. To an electronic scientist ours is a most fascinating era and history will record it as a milestone in human progress.

A common denominator to our three-dimensional measurement of military might is manpower. It seems evident that in any foreseeable major conflict, we shall be definitely inferior in numerical strength. We must, therefore, exploit our technology and industry to overcome this disadvantage. Obviously, we must continue our research and development efforts in the well established fields of radio and wire communications to the end that our forces may be given the means of transmitting intelligence with vastly increased speed, security, and reliability. But this is not enough. We must exploit our technology to the utmost in extending man's ability to sense the features of his environment. We must provide electronic systems for locating the enemy, for guidance of our own troops over all types of terrain, for automatically evaluating rapid changes in combat situations, and eventually—for destroying the enemy.

In my opinion, these new and subtle problems of surveillance and evaluation and control represent a far greater intellectual challenge to the electronic scientist than those he has dealt with in the past. We in the Armed Services look to you in the electronics and communications industry to help us solve these problems. Their solution is imperative in the interest of placing such equipment in the hands of our troops as will give them an advantage, offensively and defensively, despite any potential enemy's superiority in numbers alone.

Let us look for a moment at the situation which faces the front-line ground soldier in Korea today, — the soldier who, in the last analysis, is called upon to close with the enemy and to seize and hold ground essential to victory. In the forward area, he is forced to fight with the weapons that he can carry on his back. His task on patrols and in the fox-holes of the front line is an arduous and a lonely one. Of necessity, the front-line ground soldier must depend on the support of heavier weapons, both ground and air, in those situations where small arms



fire alone will not accomplish the task. And it is here that communications and electronics equipment can and must play a vital role. At all times he must have the facility for requesting and receiving prompt support from neighboring units and units in the rear. If he does not receive support of this character, undue casualties result —and his casualties are high at best. Firepower, no matter how great, is of little avail if the means for placing fire on the target in the quantity and at the time needed are not available. It is for this reason that we strive to provide an integrated communicaton system which will insure that the front-line soldier is afforded every facility for securing, when needed, the timely and full support of the members of his combat team. To do anything less would be to close our eyes to the fundamental needs of our ground soldier.

It is not the preponderance of soldiers in the front line that wins the battle, per se: It is the effectiveness with which these soldiers operate in inflicting casualties on the enemy. It is also obvious that the more soldiers on the front line, the more casualties will be incurred. It has been the long-time effort of the United States Army to reduce casualties by enabling a smaller number of front-line soldiers to be more effective than the enemy in firepower, mobility, and in communications and thus to win at minimum expense in human life. This philosophy utilizes our technological advantage. It won in World War II; it has been successful in Korea. The Army believes firmly in this philosophy of the team as opposed to the philosophy of masses of cannon-fodder.

Conventionally, the Armed Services decide what they need, based on present and conceived tactical and strategic requirements. They then proceed to let a development contract to produce equipment to satisfy this military need. During World War II, however, many of the revolutionary advances in military electronics were inspired by the scientist—the scientist advised the soldier of some new technique for which a profitable military use had been found. These fertile ideas have greatly influenced the response to tactical requirements. This points up the fact that modern warfare demands a close partnership between soldier and scientist. I should like to reaffirm what many of you already recognize, i.e., that the Signal Corps is anxious to cultivate this soldier-scientist partnership to the end that the flow of new ideas from industry and from our academic and research institutions into the military structure may be expedited.

It would, of course, be highly beneficial if every laboratory scientist had first-hand knowledge of military needs so that he could immediately foresee the military application of every advance in electronics. While it is obviously impractical for large numbers of engineers to make field trips to combat zones, visits by a limited number of key civilians—to Korea, for example,—should be beneficial. Beneficial to the Army in receiving experienced advice. Beneficial to industry and the academic world in gaining a fuller comprehension of the possible applications of electronics in the field of combat. And ultimately beneficial to our Nation in providing a higher probability of survival in the event of a full scale attack upon us. With this reasoning, the Secretary of the Army recently invited a distinguished group of scientists to visit the Korean battlefront to obtain an appreciation of the possible military application of new advances in the electronics field. The members of this group personally visited the front lines and talked to and observed our troops, learning combat problems at firsthand. While it is too early to realize the full impact of their trip, many of their recommendations already have been acted on and it has become obvious that the time and effort they have contributed will be of tremendous benefit.

Incidentally, one of the problems highlighted by the group visiting Korea was that of finding procedures which would lead to a reduction in time-lag between the arrival of a new electronic technique and its final application as a working piece of military equipment. We must close the gap between developer and user which, as you know, is a matter of several years through the normal procedures with which most of you are familiar. Even after a new idea has been translated into a piece of hardware, an appreciable time elapses while the military services test and modify and then approve it for production. Meanwhile, our troops must wait for these actions to be completed and for production to get started. The reduction of this time-lag through more efficient methods can buy us an additional technological lead-time over our possible adversaries. The importance of the lead-time cannot be over-estimated. While it is obvious that a partial solution to this problem must be dictated in large measure by the Army itself, I should like to solicit your suggestions as to ways and means for improving our present procedures.

In this connection we must bear in mind that it does the Army little good to have clever scientific ideas if the state of the manufacturing art has not advanced sufficiently to permit mass production of equipment, — equipment which is technically effective and yet small enough, light enough, and rugged enough to be readily transported to the place where it is needed and must be used.

Despite the many advances which have been made in providing our troops with improved types of equipment, we must not be complacent. Unfortunately, the hard, cold facts of combat are that the military handling of electronic gear is frequently and necessarily rougher than any test which our laboratories have devised. In making this statement I do not want to deprecate the ingenuity of our Signal Corps Laboratories for devising difficult and complicated tests. I am certain that none of our manufacturers will charge our laboratories with lack of zeal in this respect. Nevertheless, I am thinking—for example—of the new radio hand-set which recently went into service and which we purposely designed to be thin enough to fit under the soldier's helmet in proximity to his ear. This set eame through our laboratory tests with flying colors—yet the breakage rate in Korea has been quite high. How can this happen? It is simply because the soldier who has the hand-set in his hand when he is shot at hangs on to it as he hits the ground, breaking his fall with his hand and the hand-set. This was a laboratory test that nobody thought of.

I should like to emphasize the Army's ever-increasing appreciation of the importance of reliability—the reliability of its communications equipment, of its radar, of all the types of electronic equipment which it uses. I point this out as a significant trend. There was a time when radio communication, for example, was considered acceptable if communication could be obtained 50 to 75% of the time. The Army has become much more sophisticated in its requirement and now demands that its electronic equipment accomplish its mission all of the time and with a minimum of required maintenance.

There are two other important concepts that now loom large in Army thinking. I refer to the need for reducing the complexity of our electronic gear and the need for reducing its cost. During the past year the Army has carefully studied these problems and we are convinced that it is essential that equipment be designed to perform

(*Continued on page 66, col. 1*)

Electronics in SPACE

By Charles DeVore
Naval Research Laboratory

This is the second in a series of two articles on the role of Electronics in NRL's upper atmosphere research program using rockets as the research vehicles.

Ionosphere propagation experiments are another objective of the upper atmosphere program, with obvious application to radio communication. For this purpose, separate rocket-borne instrumentation has been developed by NRL scientists, including J. C. Seddon and John E. Jackson. This equipment involves the transmission of two crystal-controlled c-w radio-frequency signals from the rocket to special receiving and recording equipment at suitable locations on the ground. Radio signals are transmitted from the rocket at frequencies of 25.644 mc and 4.274 mc, an exact 6 to 1 ratio. The upper frequency was chosen high enough to be essentially unaffected by the ionosphere, whereas the propagation characteristics of the lower frequency are influenced considerably by the physical conditions of the ionosphere.

The received signals are combined and recorded as a time variation of the relative phase difference between the received signals. From this data, the index of refraction at the rocket can be determined for the transmitted low-frequency wave. This, in turn, provides the starting point for calculating such quantities as electron density, ion density, magnetic-field intensity, and electron-collision frequency.

The airborne instrumentation thus required two stable transmitters, operating at the stated frequencies, and an antenna system radiating efficiently in the direction of the ground stations. In addition, the two output frequencies had to be synchronized in a 6 to 1 ratio and maintained in a constant relative phase at the transmitting antenna.

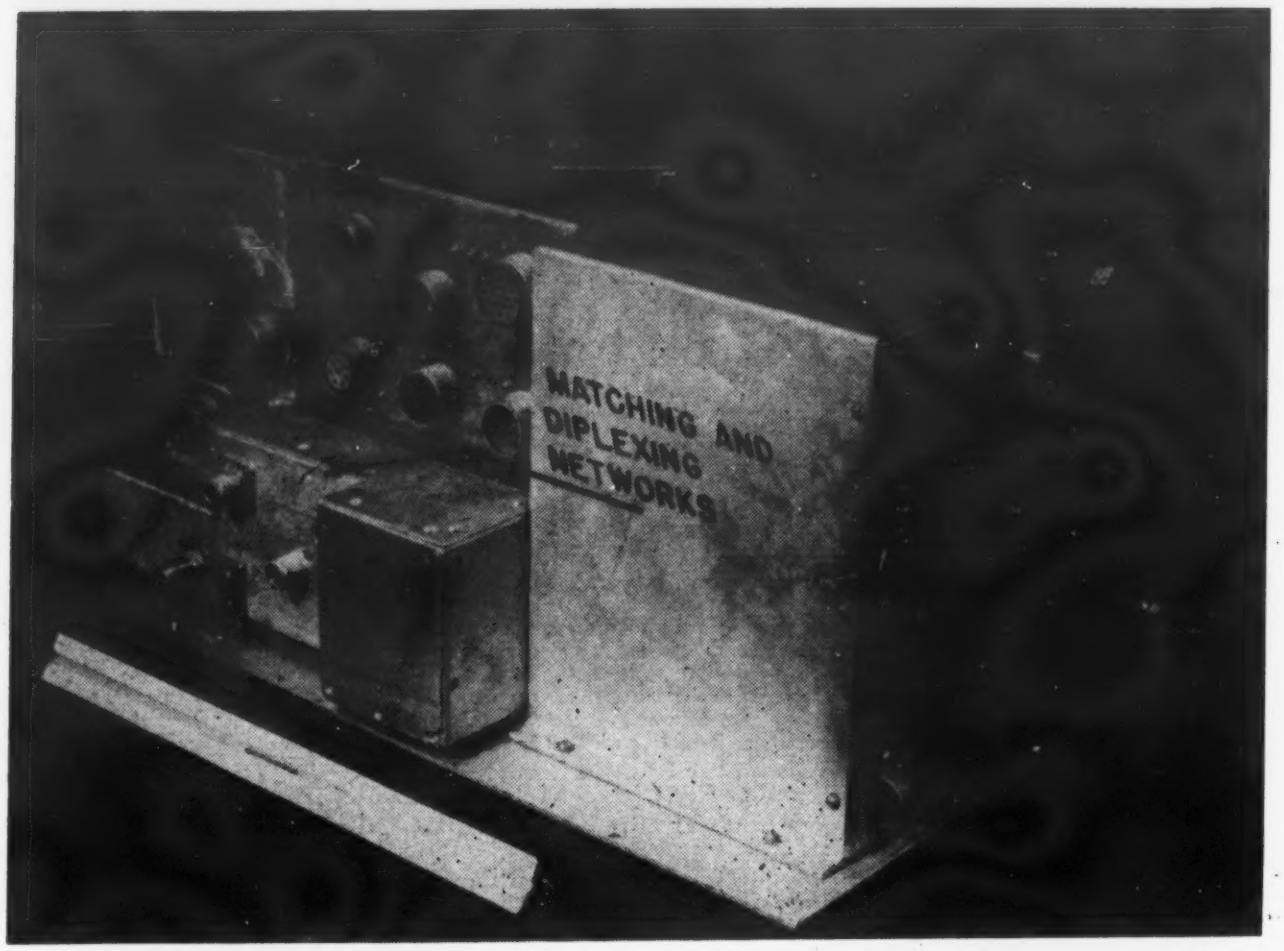
The airborne equipment presently used represents gradual improvements over that used at the start of the program in 1946. It consists of a transmitter, autotune and retuning units, and appropriate matching and diplexing networks. The present transmitter, used for the first time on a Viking flight in 1950, represents a complete redesign of the previous model. Thanks to improvements in the antenna system, the new transmitter requires only ⅓ the output power of the previous one. Weight and volume were also reduced by a factor of 3.

The new transmitter weighs 21 pounds and its dimensions are approximately 11 by 10 by 8 inches. A single crystal oscillator maintains the frequency stability for both the 4.274 and the 25.644 mc outputs. Transmitter output power values are about 13.5 watts at the lower frequency and 9 watts at the higher frequency. Mechanical considerations were taken into account in the redesign; for example, the dynamotor can now be replaced in less than 10 minutes.

Micromatch circuits are inserted between the two output tanks and their respective loads; such circuits indicate transmission line standing-wave ratios.

Separate tail antennas were used on the V-2 rockets, with appropriate separate matching networks. On later Viking rockets, however, it was decided to use a whip-type antenna. Since the installation of two separate sets of such antennas on the Viking would have required an excessive amount of space, an attempt was made to combine both high- and low-frequency antennas into a single antenna, with a total length of only 15½ feet. The attempt was successful; a diplexing whip antenna constructed in two collinear sections was developed which has a radiation pattern at the upper frequency similar to that of a half-wave center-fed half-wave dipole.

One important factor which had to be considered in the design of this 15-foot whip-type antenna for use on a Viking rocket was the considerable air drag existing during the first 30 miles of ascent. The use of such a long antenna at low altitude would impose extremely large mechanical stresses on the antenna and would also interfere with the rocket flight, causing serious loss in altitude. To



Airborne instrumentation carried in Viking rockets for ionosphere propagation studies transmits two crystal-controlled c-w signals to ground receiving stations.

keep the antenna out of the air stream until an altitude was reached where drag was no longer serious, the antenna was folded along the rocket skin during the early part of the flight. Clips were provided at the antenna tips to minimize antenna vibrations during the powered flight of the rocket and fairings were used ahead of the antenna for streamlining. An opening mechanism, actuated by a rocket timer, was used to bring the antenna to a position perpendicular to the rocket axis 80 seconds after take-off, where the rocket has reached the end of its power flight and an altitude of approximately 34 miles. A second timer was used to turn on the propagation transmitters at the same time (they were placed in a stand-by position two minutes prior to take-off). The complications introduced by timing and opening problems, however. have been more than compensated by the many desirable features of the whip antennas, as the transmitter redesign indicates.

The diplexing whip antenna also complicated the matching and diplexing network problem, but this, too, was solved.

Difficulties experienced with the determination of changing antenna impedance values during rocket flight led early to the development of an autotune unit. This unit controlled the rotation of the variable capacitors in the antenna matching networks and utilized the micromath information to determine which capacitor position gave the best standing-wave ratios at the output of the transmitters. Low- and high-frequency operations were done consecutively to permit the use of a single amplifier in the autotune for both tuning operations. Certain circuit modifications were made in the V-2 unit for use on the Viking rocket, largely in the use of smaller driving motors with permanent fields for rotating the variable capacitors.

Changes experienced with the V-2 rocket in antenna impedances after the automatic tuning operation led to the development of a retuning unit for the Viking which would initiate a new tuning operation at a high altitude—48 miles—where perhaps the effects observed at the lower altitudes would no longer take place.

In the case of the propagation experiments, where the ionosphere data was obtained from measurements on the ground, telemetering was not an essential requirement. The use of telemetering channels, however, supplied valuable information about transmitter performance and about antenna impedances during flight that led to valuable design improvements.

Although the experiments were intended primarily for ionosphere studies, the unusual problems encountered have led to advances in other fields. An important by-product, in the opinion of the NRL scientists, has been the general knowledge and experience gained in the new art of rocket instrumentation, and especially in the design of airborne low-frequency radio transmitters and antennas.

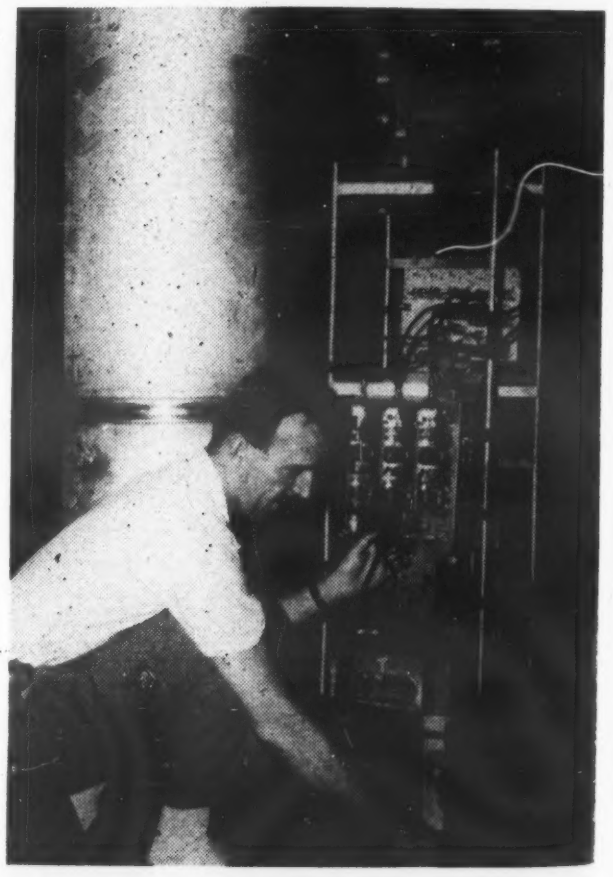
Another objective of the upper atmosphere research program at NRL which makes use of electronics is the direct measurement of solar radiation intensities below 3100 angstrom units, in the far ultra-violet end of the spectrum. Special photographic spectrographs have been designed for this purpose, and have been successful in measuring intensities down to 2200 angstroms.

Below that wavelength, however, the roll and yaw or precession of the rocket prevents a sufficient exposure time at the shorter wavelengths where the spectrum has a low intensity. The NRL "Sun-follower" developed by the Optics Division, provided the answer to this problem. In brief, what this device does is to search for the sun in the azimuth plane automatically, and, having located it, to stop and track it both in azimuth and elevation while simultaneously providing rocket-aspect data and tracking-error data for telemetering.

The Sun-follower is built into the nose of the rocket and stabilizes the ultraviolet spectograph by means of error signals derived from the sun. This is accomplished with a photocell error-signal generator which is servo-driven simultaneously about two independent axes. One axis (azimuth) is collinear with the longitudinal axis of the rocket and the other (elevation) is perpendicular to it and rotates about it.

The principle of the stabilization system, it is interesting to note, is similar to that of the tracking unit

Charles Y. Johnson, NRL scientist, makes final checks on instruments for cosmic ray studies with Skyhook balloon.



employed in the SCR-584 radar, except that the phototube error-signal generator and low-frequency amplifier replace the radar's r-f transceiver. The optic axis of the spectrograph is mechanically aligned with the optic axis of the error-signal generator. Since the error-signal generator tends to line up with the sun, the spectrograph automatically follows.

The Sun-follower permits use of spectrographs, also designed and built at NRL, that are capable of measurement of wavelengths as short as 500 angstroms.

Since the Sun-follower that has been described was suitable only for the V-2 rockets, a lighter-weight model was developed for Aerobees and Vikings. This lightweight model corrects in azimuth only, whereas the V-2 model corrected in both azimuth and elevation.

As mentioned previously, sun-to-rocket aspect data are also telemetered by the Sun-follower. For use on rockets which do not have the benefit of two-axis Sun-follower installations, a small, lightweight, and inexpensive photoelectric sensing unit has been developed to furnish such information. With this device, aspect angle and roll-rate data can be obtained with an accuracy of better than plus-or-minus 2 percent over a field-of-view angle of 115 degrees.

Various problems were encountered in the several electronic developments due both to the limitations imposed by the research vehicle and to the method of experimentation. Space and weight, as well as freedom from radio interference with other scientific instruments carried in the rocket, had to be considered. In addition, the equipments had to be physically rugged and electrically stable to operate successfully under the severe conditions of vibration, aerodynamic drag, acceleration, and temperature changes occurring during flight—conditions for which there was no operating guide at the time the upper atmosphere research program was begun. For example, temperatures encountered by the rocket in its flight may be as low as 100 degrees below zero Fahrenheit. Accelerations may be in excess of 15 g. Speeds are upward of 4000 miles per hour.

Although it was anticipated that the vibration of the rocket alone might be destructive to instruments within it, solutions have been found for every problem to date. No elaborate antivibration mountings have been used or found necessary. In the case of electronic equipment in particular, good construction practice has sufficed. Units have been designed which are compact, lightweight, yet rugged enough to withstand operating conditions. In most instances, the electronic units are housed in pressurized cases not unlike those used in conventional aircraft electronic equipment. Of special significance from the reliability standpoint is the fact that there have been relatively few failures in electron tubes attributable to vibration encountered in flight, even though as many as 300 have been used at one time.

Other special, non-electronic devices have been used in rockets for various atmospheric observations, including atmospheric gages, geiger counters, and cameras. Data obtained through such devices (apart from the cameras, of course) have been transmitted through the flight telemetering system.

Nor has electronic equipment for upper atmosphere research been limited to rockets. High altitude plastic balloons commonly known as "Skyhooks" have been—and are being—used by the Office of Naval Research for cosmic ray studies. Such balloons are the latest answer to the scientist's desire to "get up high enough"—over 100,000 feet—and "to stay there long enough" to study the primary cosmic rays of very high energy. These particles cause observable events very infrequently, perhaps only once in twelve hours and are free from secondary radiation only above 110,000 feet. Rockets can reach this height, but can't stay there; airplanes can't go high enough. So the "Skyhook" was designed by General Mills, Inc., on a Navy contract to provide the answer. From data obtained, scientists hope for additional answers to these questions: Where do the particles come from? What do they do? What is their nature? What is their energy?

Two types of instrumentation are carried in pressurized gondolas below the balloon. One contains instruments for recording and transmitting flight information and for providing necessary safety controls on the flight. These include a 40-mc transmitter which sends altitude and temperature information to a ground receiving station and is calibrated to be accurate at altitudes above 80,000 feet. A 2-mc transmitter sends altitude information to the launching site and tracking vehicles. This transmission is in the radio-frequency range of the automatic direction-finding equipment carried by the tracking plane and trucks.

(*Continued on page 68, col. 1*)

NRL Sun-follower, designed for use on Aerobee rockets, automatically searches for the sun in the azimuth plane, and, having located it, stops and tracks it in azimuth while simultaneously providing rocket-aspect data and tracking-error data for telemetering.

Exercise Watchdog

Lt. Gen. Willis D. Crittenberger — *Col. Francis E. Kidwell*

This continuous two-day advance command post exercise was staged for the purpose of testing staff operations and communications in the field.

By: Major William F. Brott

Exercise *Watchdog*, directed by Lieutenant General Willis D. Crittenberger, Commanding General First Army, was conducted during the period 20-21 October 1952 to promote knowledge of related plans within the First Army Area and to provide field training for Headquarters First Army Staff Sections, Commanders and Staffs of First Army installations.

Although few units were employed tactically under simulated combat conditions not unlike the ever increasing pace of modern warfare, the requirement for more and faster signal communications existed throughout the conduct of the exercise.

To meet this requirement, the First Army Signal Officer, Colonel Francis E. Kidwell, provided an integrated and flexible signal communications system from the First Army Field Headquarters (including the Forward and Rear Echelons) to major subordinate headquarters and to lateral participating headquarters.

The integrated signal communication system consisted of: tactical telephone; radiotelephone (including ship-to-shore); radiotelegraph; and land line and radioteletype circuits. All circuits were engineered to replace or to operate in conjunction with existing commercial communications.

To insure a high degree of flexibility in the interconnection of circuits, a completely mobile Communications Central, AN/MSC-1, was utilized at the First Army Field Headquarters. This assembly provided terminating, switching and testing facilities for common battery and local battery telephone lines, universal trunk circuits, teletypewriter loops and cryptographic facilities for message center use. A single channel radioteletype circuit was provided by Radio Set AN/MRC-2 connected through the teletypewriter switchboard for operation on either a half or full-duplex basis. Working from the TC-10 telephone switchboard were: tie lines to major subordinate headquarters and lateral participating units; VHF circuits to First Army Forward, First Army Rear, ship-to-shore and to a strategically located signal installation within the metropolitan area of New York; and commercial toll circuits for use as required within the First Army Area. Working from the teletypewriter switchboard group were full duplex teletypewriter circuits to major subordinate and lateral participating units as well as tape relay service through the First Army portion of the Army Command and Administrative Network.

The effectiveness of communications, simulated or actual, depends upon the standardization of signal procedures, methods, doctrines and on the operating characteristics of communications equipment. Signal communications during Exercise *Watchdog* were successful because these requirements were met. Again, the Signal Corps *"Got The Message Through."*

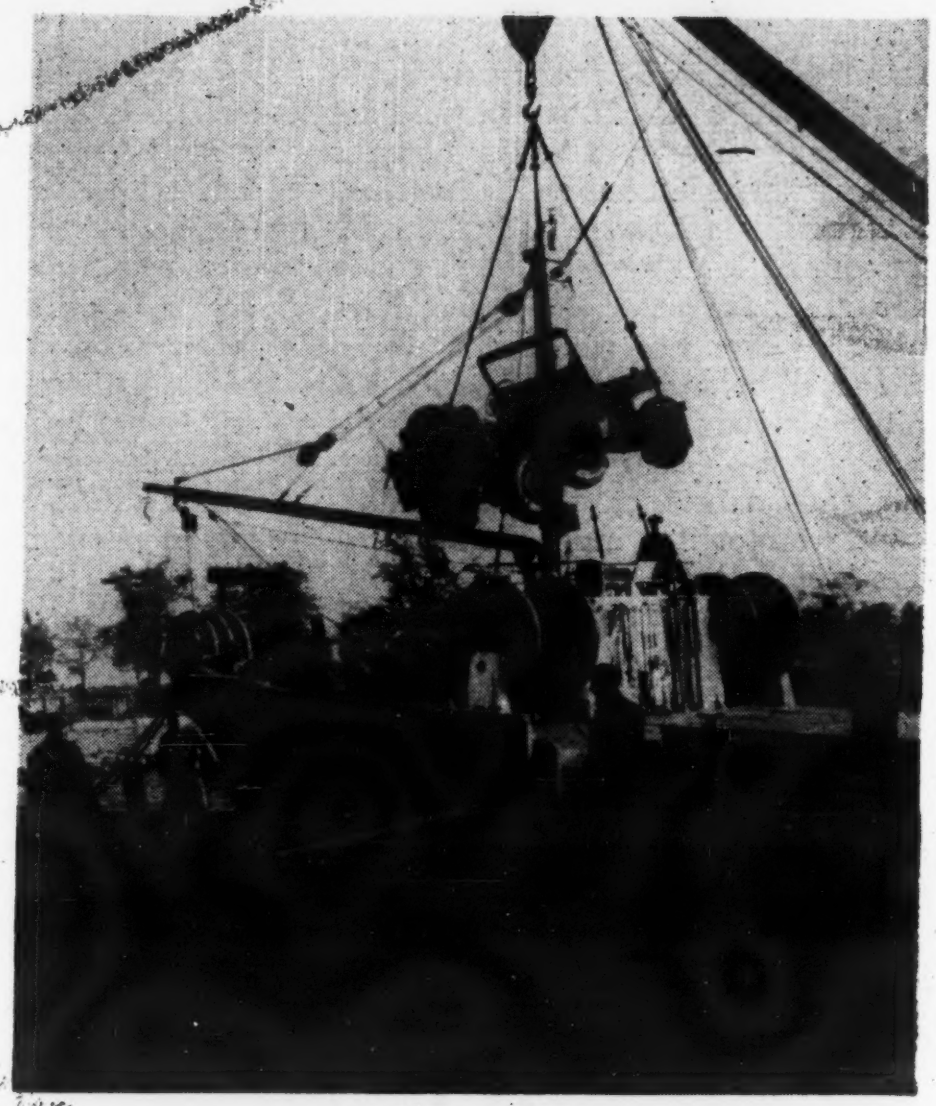
Above, left: Coordinating operations from his command vehicle General Crittenberger is shown with Major General Donald McGowan, Commanding General, 50th Armored Div. (far side); Capt. Alexander M. Wawalszyk, Asst. Chief of Staff, 3rd Naval District; and Colonel Francis E. Kidwell, Signal Officer, 1st Army.

Above, right: All phases of communications including radio, teletype and telephone were thoroughly tested during "Exercise Watchdog." Lt. Col. Gene M. Ranvier, 1st Army, receives a message via helicopter during the exercises.

Right: A radio jeep to be used in the exercise being unloaded from the U. S. Army cableship Ellery W. Niles.

Below, right: Evidencing his usual interest in how the troops are being fed, General Crittenberger is shown testing the pie held by Sgt. Kieth A. McGee of the 517th Car Co., Fort Jay, as Pvt. Carmen Maratta of H Company, 60th Infantry looks on.

Below, left: Personnel of the 24th Signal Service Battalion, Fort Devens, Mass., which provided the communications for the exercise, operate the teletype equipment used.



DOING IT THE HARD WAY

By: Lt. Col. Arthur K. Ransom

Last issue we presented a brief description of the SCHNICKLEFRITZ ALTERNATOR. It appears that this was a rather hard nut to crack for some of our readers. Of the forty-seven of you who wrote in, only thirty-four came up with the "approved solution." We don't want to quibble—and anyway, our records are not complete—but most authorities agree that the device presented in this column last issue was the Goldschmidt Alternator.
Now let's investigate

THE FERRO-NANGLING DETECTOR*

***Non-secret short title**

"A continuous band made up of a group of fine iron wires revolves on the ebony grooved wheels W which are turned by clockwork in the base of the instrument. The band passes through the glass tube G, which has a small single layer of fine wire comprising 6 to 10 turns through which the radio frequent oscillations flow. Directly over this winding is placed the small bobbin of wire S which has approximately the resistance of the headphones P-1. Two horseshoe permanent magnets with like poles adjacent are mounted immediately above the tube and near to it. Some argument exists concerning the action of this detector during the reception of signals but it is sufficient to say that when the iron band passes underneath the two permanent magnets it undergoes a cyclic change in magnetism and is extremely sensitive to an impressed external magnetic field such as that generated by a radio frequent current flowing through the winding G.

"When electrical oscillations induced in a received aerial by a distant transmitter pass through the winding P, one complete group of oscillations sets up an alternating magnetic field which causes a single movement or change in the position of the flux in the iron band. The bobbin S being in the path of the flux, it is acted upon inductively, a current being induced in the windings which flows through the head telephone creating a single sound for each group of incoming oscillations. The note of the transmitter is faithfully reproduced, because each group of oscillations radiated by the transmitter has a cumulative effect upon the change of flux in the iron band, which causes a single movement of the telephone diaphragm.

"Although the magnetic detector lacks the sensitiveness of the crystal detector throughout the shorter range of wavelengths, as between 300 and 600 meters, for waves around 2,500 meters, it compares favorably with the most sensitive crystal rectifiers.

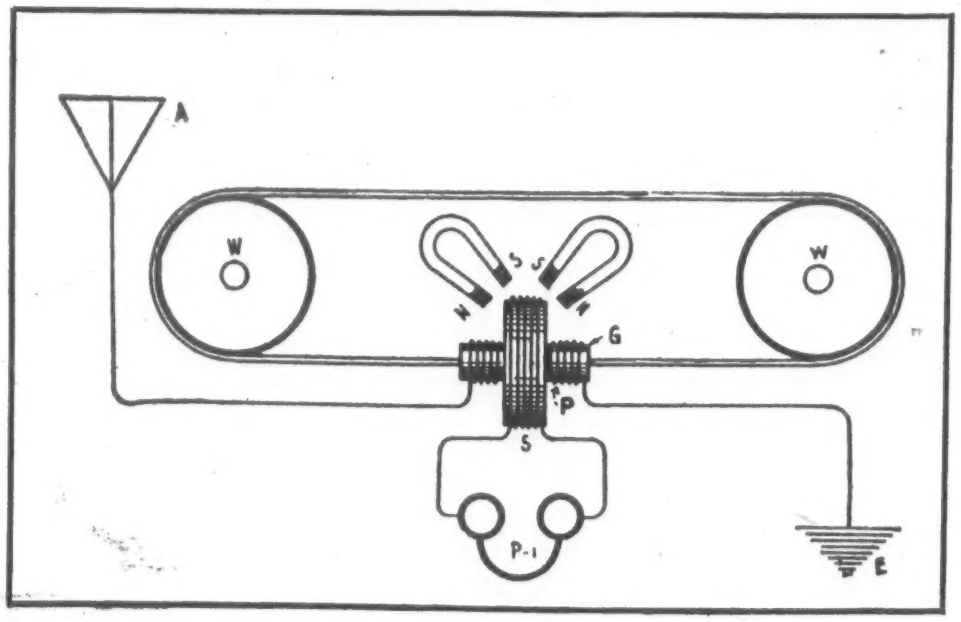
"The magnetic detector may be connected directly in series with the aerial system, but it functions best in the circuits of the multiple tuner. In general, the circuits of this tuner appear similar to that of the valve tuner, but the secondary winding for the magnetic detector has very few turns as compared with the secondary of the valve tuner. The magnetic detector has low resistance compared with crystal detectors and, in consequence, the stopping condenser of the usual detector circuit becomes an active element of the closed oscillation circuit and must therefore be of variable capacity. In fact, placing the detector in series with the secondary circuit not only calls for a winding of low inductance but one of low resistance as well. Hence the secondary coil is usually wound with rather coarse wire, such as No. 18 or No. 20 B and S.

"It has frequently been observed that the magnetic detector gives better response to 500 cycle transmitters when the iron band revolves at a speed about twice that used in receiving from 60 cycle transmitters. Normally the band travels at a very low speed—a few feet per minute."

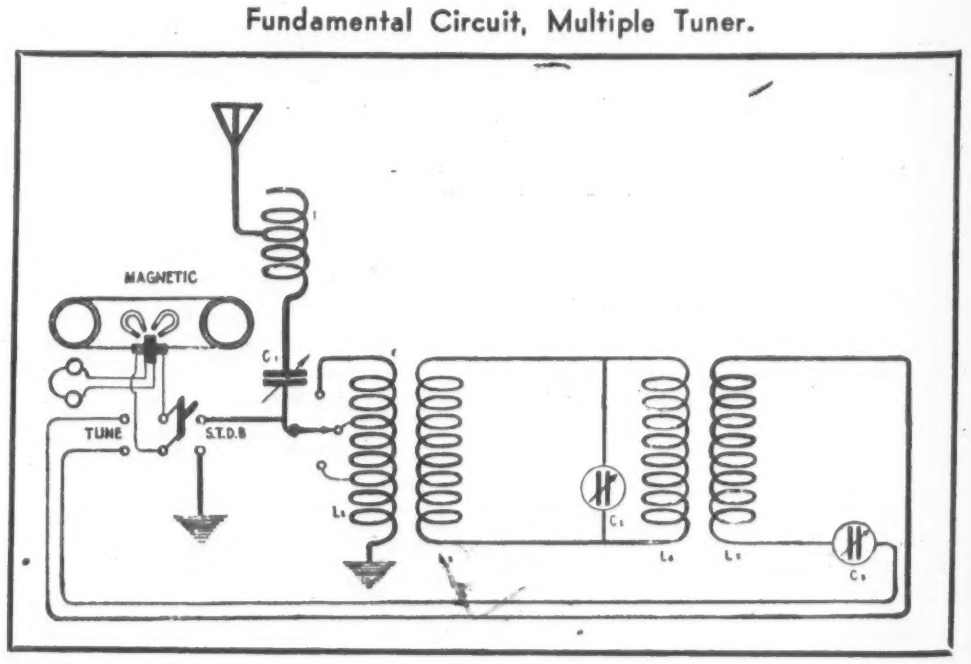
* * * *

Well, folks, there you are. What well-known pioneer in the field of communications is nominally credited with the development of this magnetic detector? As usual, send your nomination to Dept. X, in care of SIGNAL, 1624 Eye Street, N.W., Washington, D. C. Watch next issue for the answer.

Magnetic Detector.



Fundamental Circuit, Multiple Tuner.



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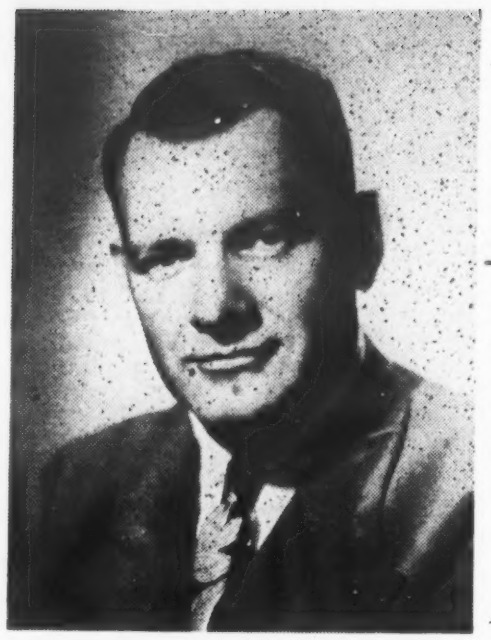


From the President

President Wally Watts finds that the past year, from both the AFCA and the Industrial - Armed Services standpoint, has shown marked improvement. He believes 1953 will continue this trend.

With this first issue of 1953 I want to review briefly some 1952 developments in the Association's sphere of interests so as to draw therefrom some guidance for the future.

The demonstrated ability of the military and industry to work together smoothly was, I think, a primary accomplishment of 1952. The rapid growth of the military and in those parts of the industrial community serving the military came to fruition in 1952 with a gradual shaking down of administrative organizations and the acquisition of "know-how" in dealing with their respective problem.

The improvement is, I think, evidenced by the general speed-up in paper work, the gradual evolution of more reasonable inspection rou ines, and the accelera'ed rate of clearance, both within the military and in industry, of manufacturing questions and problems. This has contributed most significantly to the healthy increase in the deliveries of military electronics equipment.

There remain, however, certain factors to which renewed attention should be given in 1953. With its greatly increased experience and knowledge, and without the pressure which attended the placing of procurement at the beginning of the present defense effort, the military has undoubtedly improved its ability to select the most efficient vendors for the tasks at hand. I think it unnecessary to emphasize the importance of this development to those parts of industry which have or hope to have defense work.

In some military quarters there is apparent concern over production schedule backsliding and the possibility that in all cases industry is not now employing a fair share of its best talents, particularly in the fields of engineering and production, on military business. It is, I think, directly the responsibility of industry to eliminate this concern by rededicating itself to the job at hand so as to get back on schedule and stay there.

Finally, in the military-industry relationship it should be noted that despite the progress so far made, we are not out of the woods on inspection and spare parts. To these activities much real effort must be given in 1953.

Turning to the Association itself, I think we can be justly proud of the accomplishments of 1952. Membership, both group and individual, has continued a healthy growth. SIGNAL circulation has increased sharply and its editorial content much improved. Three new local chapters, Memphis, Paris, and San Luis Obispo, were established; the Cleveland chapter was most enthusiastically reactivated; four additional chapters are now under development.

In the past six months a number of Local Chapters have afforded me the pleasure of attending their meetings and addressing them. I hope that I shall be able to attend additional Local Chapter meetings in future months.

W. W. Watts

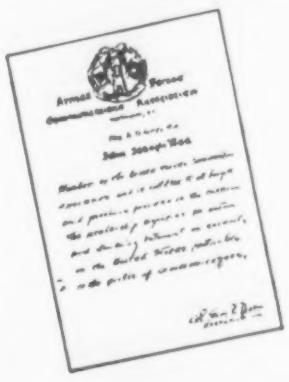
The Doings At Dayton

May 14th, 15th and 16th, the Dayton Chapter and the Air Force will be our hosts at the 7th Annual AFCA Convention.

The Convention Committee of the Dayton-Wright Chapter and the U. S. Air Force are planning a program that you won't want to miss. Check these dates on your calendar now. Reservation blanks will reach you soon, and remember we're planning a special program for the ladies.

The tentative schedule of events is outlined on page 32.

AFCA Insignia



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Association Affairs

General Guest Decorated By Korean Government

For his "exceptional, outstanding and meritorious services" while Signal Officer of the 8th Army in Korea, Brigadier General Wesley T. Guest was awarded one of the highest honors of the Korean Republic — the Order of Military Merit with a gold star. The General has now returned to the United States and on January 1 assumed his new assignment as commandant of the U. S. Army Signal School at Fort Monmouth, N. J.

Please Note

Criticism has been received recently of the views expressed in certain articles in SIGNAL. We would like to remind our readers that opinions expressed in stories or articles appearing in SIGNAL are entirely those of the author and in no way constitute the views, opinions or policies of the Armed Forces Communications Association or the editorial staff of SIGNAL. As is stated in the masthead on page 5, "Authors are entirely responsible for opinions expressed in articles appearing in AFCA publications."

Convention News

From Paul Clark, President of the Dayton-Wright Chapter, we have the latest information about the 7th Annual AFCA Convention — May 14th, 15th and 16th in Dayton — listing the following tentative agenda.

Thursday, May 14

9:00 A.M.	Registration
10:00 A.M. to Noon	Chapter Presidents' Meeting
12:30 P.M. to 2:00 P.M.	Luncheon in Ballroom of Biltmore Hotel
2:30 P.M. to 4:30 P.M.	Open Forum General Lucas V. Beau, National Commander, Civil Air Patrol Electronics Discussion Communications Discussion Photography Discussion
6:00 P.M. to 7:00 P.M.	Buffet Supper
9:30 P.M.	Dance — Music by Wright Field AF Band

Friday, May 15

9:00 A.M.	Registration
9:00 A.M. to 11:00 A.M.	National Board of Directors Meeting
11:15 A.M. to 3:15 P.M.	Wright Field, luncheon, tours, exhibits, return to hotel
6:30 P.M.	Cocktail Party
7:30 P.M.	Annual Banquet

Saturday, May 16
To Be Arranged.

The Committee Chairmen are: Major Holstead and John Wilkinson in charge of hotel registration and hotel planning; Col. Fertig and Sgt. Crowley handling Wright Field details. Paul Clark is arranging for speakers, and Jesse Walden is publicity chairman.

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Type of Membership desired: Full—$5.00 ☐ Student—$2.00 ☐ Life—$100.00 ☐
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These extensive facilities were set up specifically to further original research and development conducted by Admiral for the government in the fields of radiac, radar and radio reception and transmission. In all of these fields Admiral is currently engaged in large scale production on government contracts. Admiral's ably staffed laboratories are complemented by experienced production crews. Large produtive capacity is available for additional government electronics output.

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AFCA Group Members

Communications—Electronics—Photography

Listed below are the firms who are group members of the Armed Forces Communications Association. By their membership they indicate their readiness for their share in industry's part in national security. Each firm nominates several of its key employees or officials for individual membership in AFCA, thus forming a group of the highest trained men in the electronics and photographic fields, available for advice and assistance to the armed services on research, development, manufacturing, procurement, and operation.

Acme Telectronix
Admiral Corporation
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Almo Radio Company
Altec Lansing Corporation
American Cable & Radio Corp.
American Electroneering Corp.
American Institute of Electrical Engineers
American Phenolic Corporation
American Radio Relay League
American Telephone & Telegraph Co.
Anaconda Wire & Cable Company
A. R. F. Products, Inc.
Andrews Corporation
Argus Cameras, Inc.
Arnold Engineering Company
Audio Products Corporation
Automatic Electric Company
Automatic Electric Sales Corp.
Baltimore News Post
Barry Corporation, The
Bell Telephone Company of Pa.
Bendix Radio
Bergsma Brothers
Bliley Electric Company
Breeze Corporation
Burnell & Company
California Water & Telephone Co.
Cambridge Thermionic Corp.
Capitol Radio Engineering Inst., Inc.
Cargo Packers Inc.
Carolina Telephone & Telegraph Co.
Central Radio and Television Schools
Chesapeake & Potomac Tel. Co.
Churchill Cabinet Co.
Cincinnati & Suburban Bell Tel. Co.
Collins Radio Company
Columbus Process Co., Inc.
Copperweld Steel Company
Cornell-Dubilier Electric Corp.
Corning Glass Works
Coyne Electric School, Inc.
Croname, Inc.
Crosley Division-Avco Mfg. Corp.
Diamond State Telephone Co.
Dukane Corporation
DuMont, Allen B., Laboratories, Inc.
Eastman Kodak Company
Electronic Associates, Inc.
Elgin Metalformers Corporation
Espey Manufacturing Co., Inc.
Federal Mfg. and Engineering Corp.
Federal Telephone & Radio Corp.
General Aniline & Film Corp.
General Cable Corporation
General Communications Co.
General Electric Company
General Instrument Corp.
General Insulated Wire Works, Inc.
General Telephone Corp.
General Transformer Co.
Gilfillan Bros., Inc.
Globe Wireless, Ltd.
Graflex, Inc.
Gray Manufacturing Co.
Guardian Electric Mfg. Co.
Hallicrafters Company
Haloid Company
Hammarlund Manufacturing Co., The
Hazeltine Electronics Corp.
Heinemann Electric Company
Hercules Motor Corp.
Hoffman Radio Corp.
Hughes Aircraft Company
Hycon Manufacturing Company
Ilex Optical Co.
Illinois Bell Telephone Co.
Indiana Bell Telephone Co.
Institute of Radio Engineers
Indiana Steel & Wire Co.
International Business Machines
International Resistance Co.
International Tel. & Tel. Corp.
Jacobsen Manufacturing Co.
James Knights Co., The
Kellogg Switchboard & Supply Co.
Kester Solder Company
Kleinschmidt Laboratories, Inc.
Lavoie Laboratories
Leich Sales Corporation
Lenkurt Electric Company, Inc.
Lenz Electric Manufacturing Co.
Lewyt Corporation
Loral Electronics Corporation
Machlett Laboratories, Inc.
Magnavox Company
Majestic Radio & Television, Inc.
Mallory, P. R., & Co., Inc.
Martin, Glenn L., Company
Merit Transformer Corp.
Michigan Bell Telephone Company
Motorola, Inc.
Mountain States Tel. & Tel. Co.
Muter Company, The
National Cash Register Co.
National Company, Inc.
New England Tel. & Tel. Co.
New Jersey Bell Telephone Company
New York Telephone Company
Northwestern Bell Telephone Co.
Oak Manufacturing Co.
Ohio Bell Telephone Co.
O'Keefe & Merritt Company
Pacific Mercury Television Mfg. Corp.
Pacific Telephone & Telegraph Co.
Philco Corporation
Photographic Society of America
Pickering & Company, Inc.
Pioneer Electric & Research Co., The
Platt Electronics Corporation
Precision Apparatus Co., Inc.
Radiart Corporation
Radio Condenser Company
Radio Corporation of America
RCA Victor Division
Raymond Rosen Engineering Products, Inc.
Ray-O-Vac Company
Raytheon Manufacturing Company
Reeves Instrument Corp.
Remington Rand, Inc.
Robco Mfgr. Division Pilot International Corp.
Saxonburg Potteries
Seeburg, J. B. Corporation
Sherron Electronics Co.
Shoup Engineering Company
Simmon Brothers, Inc.
Society of Motion Picture Engineers
Sonotone Corporation
Soundscriber Corp.
Southern Bell Tel. & Tel. Co.
Southern New England Tel. Co.
Southwestern Bell Telephone Co.
Sperry Gyroscope Company
Sprague Electric Company
Stackpole Carbon Company
Standard Coil Products Co., Inc.
Standard Piezo Co.
Standard Transformer Corp.
Stewart-Warner Corporation
Stromberg-Carlson Co.
Stupakoff Ceramic & Mfg. Co.
Sylvania Electric Products, Inc.
Technicolor Motion Picture Corp.
Telephone Services, Inc.
Telephonics Corporation
Teletype Corporation
Times Facsimile Corporation
Transmitter Equipment Mfg. Co.
Trav-ler Radio Corp.
Tung-Sol Lamp Works, Inc.
United States Rubber Company
United Telephone Co.
Utah Radio Products Co., Inc.
Voltz Brothers, Inc.
Waterman Products Co., Inc.
Wells Sales, Inc.
West Coast Telephone Co.
Western Electric Company, Inc.
Western Union Telegraph Co.
Westinghouse Electric Corp.
Weston Electrical Instrument Corp.
Whitney Blake Co.
Wickes Engineering & Construction Co.
Willard Storage Battery Company
Wisconsin Telephone Company
Wollensak Optical Company
York-Hoover Corporation
Zenith Radio Corporation

Here's what's happening in electronics at CROSLEY

Did you know that as far back as 1922 Crosley was pioneering in electronics?

. . . that over 30 years ago Crosley brought out the first popular-priced radio?

. . . that one of the first three stations in the country ever to be granted a commercial license was Crosley's WLW, Cincinnati—"The Nation's Station"?

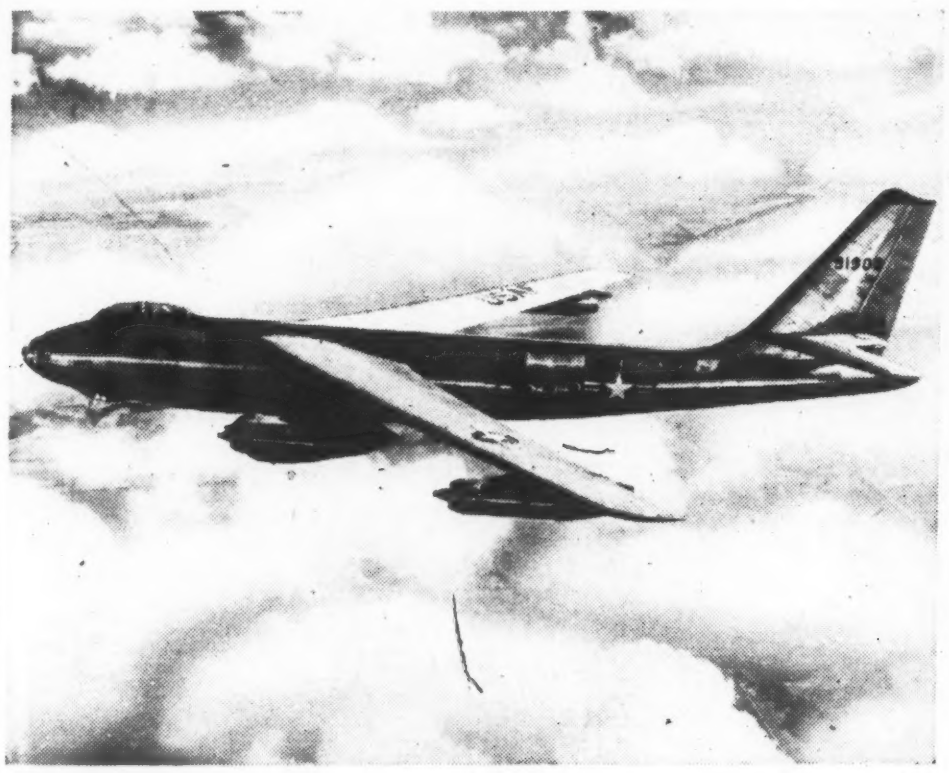
Today, 32 years later, the famous CROSLEY trade name appears not only on radios, television sets and appliances of almost every description in millions of homes throughout the country, but on some of the most vital military equipment.

Crosley, and its parent company, Avco Manufacturing Corporation, is turning out complete wing and empennage assemblies for large aircraft . . . supplying both radial engine and jet-turbine components to the Air Force.

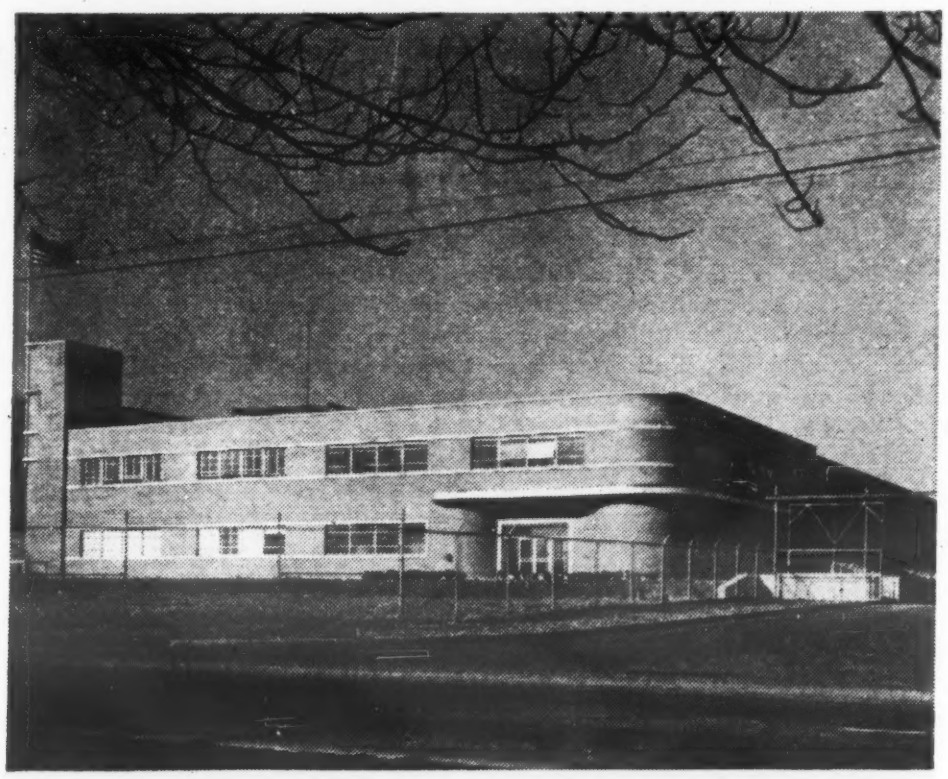
Standardized series of ground communications equipment and compact transmitter-receiver units are being manufactured for the Army Signal Corps at Crosley plants.

Production of armament control systems for the Navy is in full swing. Crosley, today, is one of the nation's largest manufacturers of over-all military products.

Classified electronic armament equipment *and this huge tail section which houses it are produced by Crosley for the Air Force B-47 Stratojet Bomber. In addition, Crosley manufactures tail-cone and wing-flap assemblies used on the mighty B-36 Bomber.*



The Air Force's new B-47 Stratojet Bomber *uses a Crosley-produced armament device employing more than two hundred vacuum tubes. Electrically operated bomb racks, which support and release heavy bomb loads, also come from Crosley.*



Crosley's newest plant, *located in the Evendale section of Cincinnati, today turns out vital electronic equipment for Air Force Bombers and Fighters. Construction of this plant began in December 1951, and* less than one year later *the first electronic systems rolled off assembly lines.*

National Director of Chapters: Maj. Gen. George I. Back

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UNIVERSITY OF CALIFORNIA, Berkeley, Calif.

UNIVERSITY OF ILLINOIS: Urbana, Ill.

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National Headquarters Chapters Secretary: Julia B. Godfrey

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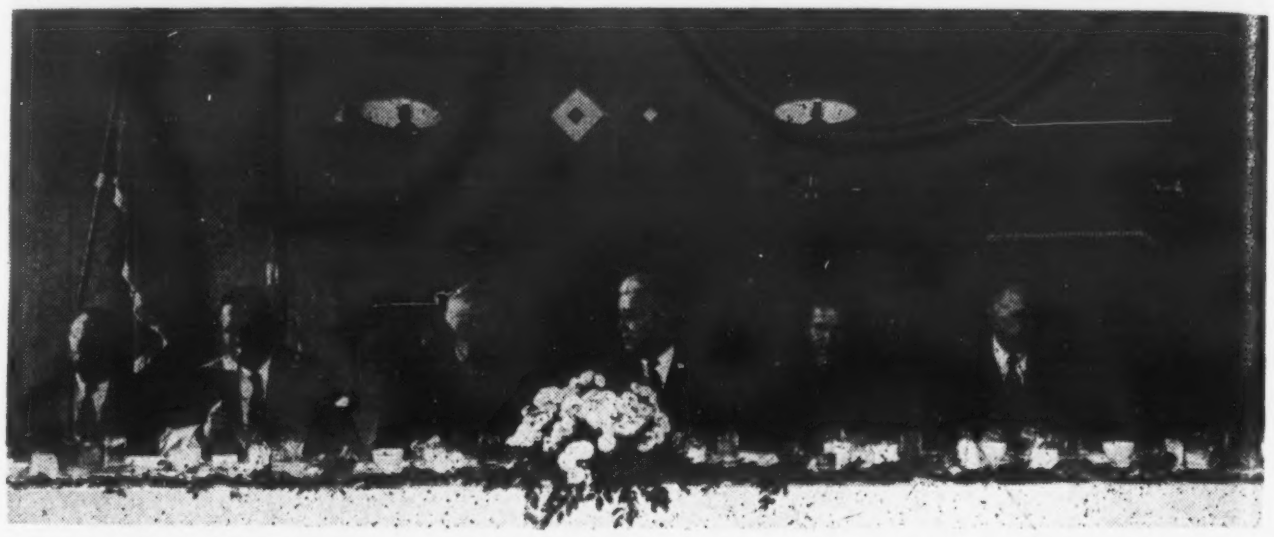
Chapter News

Atlanta

Chapter members were impressed with the magnitude of the operations performed at the Atlanta General Depot when Col. Frank G. Marchman, commanding officer of the depot, described them in the principal address at the chapter's December 5th meeting. Touching upon each phase of activity, Col. Marchman succeeded in giving the audience an excellent over-all picture of the installation.

The dinner-meeting took place at the officer's club of the Atlanta General Depot, with 95 members and guests in attendance. Honor guests, in addition to Col. Marchman, were Lt. Col. W. M. Coeyman, deputy signal officer, Third Army, and Charles Eberhart, president of the Augusta-Camp Gordon Chapter.

A nominating committee for the annual elections was appointed as follows: Ralph S. Grist, Southern Bell Tel. & Tel. Co., chairman; Col. S. P. Collins, Fort McPherson; Jack Evans, Western Union; Lt. Col. Donald L. Adams, Georgia Tech; and Robert J. Smith, Atlanta General Depot.



Head table at Atlanta Chapter's December 5th meeting. L to r: R. J. Smith; Charles Eberhart, president, Augusta-Camp Gordon Chapter; Col. Frank G. Marchman, guest speaker; Atlanta Chapter President P. R. Curry; Lt. Col. Robert M. Bond; Ralph S. Grist and Lt. Col. W. M. Coeyman.

Augusta-Camp Gordon

A small but lively item of communication equipment—the homing pigeon—was discussed at the November 5th meeting by Maj. George A. Schick, supply and services division, Southeastern Signal School. In addition to describing the use of pigeons in World War II, Maj. Schick explained many interesting facts about racing pigeons—how racing pigeon clubs are formed, the releasing of pigeons at race stations, how they are timed, etc.

A distinguished guest of the chapter was Col. Eigil Havsteen, chief signal officer of the Western Command of Denmark's vital Jutland peninsula and commanding officer of the Jutland Signal Regiment. In a short talk expressing his appreciation and that of his country for the excellent cooperation of the United States, Col. Havsteen stated he was especially grateful for the fine welcome accorded him at Camp Gordon and the valuable training he was receiving there. He also thanked the chapter for the opportunity of attending its meeting.

A tour of radio station WGAC in Augusta featured the chapter's November 25th meeting which followed a social hour and dinner at the Augusta Arsenal. Jess Williard, general manager of WGAC, was guest speaker. Dinner music was furnished by Claude Casey and his Sage Dusters.

The members were conducted on the tour by Jack Jopling, station engineer, who explained the many interesting phases of the station's operations.

At its meeting on December 17th, at which Col. George Dixon, National Executive Secretary was a special guest, the chapter elected officers for 1953 as follows: president—Lt. Col. Fred Elser, Camp Gordon; vice-presidents—John Owen, Southern Bell Tel & Tel Co.; Maj. Joseph Sahm, Camp Gordon; secretary-treasurer—Lt. Col. Harold Williams, Southeastern Signal School. (Full report of the meeting will appear in the next issue.)

1953 Chapter of the Year

On December 31st, with only three more months of the contest to go, the leading chapters were lined up as follows:

	POINTS
Augusta-Camp Gordon	25.20
Decatur	24.00
Dayton-Wright	16.30
Pittsburgh	15.71
New York	14.05
Seattle	13.42
Boston	12.79
Chicago	11.97
South Carolina	11.58
Philadelphia	11.13

Chicago Chapter's October 30th meeting was held at DeForest's Training, Inc. Shown during the meeting, below, are, l to r: Max R. Klein, director, Army Film Library Services, Fifth Army; Dick Brennan, Motorola; William C. DeVry, chapter vice president; and Cdr. A. N. Dugar, Great Lakes Naval Training Station.

Baltimore

The first of a series of unusually interesting meetings being planned for Baltimore Chapter members was held on November 13th with the Baltimore Filter Center as the program feature. Prior to a conducted tour of the center, members met for dinner at the Riviera Restaurant and heard Major Curtis, commanding officer of the Baltimore Filter Center, describe its purposes and operations.

Pointing out that the filter center, which controls 240 observation posts in Maryland, parts of Delaware, New Jersey, Virginia, West Virginia and the District of Columbia, had only 20% operational capability due to the lack of civilian participation in

he defense system, Major Curtis stressed the need for more volunteers for "Operation Skywatch." Stating that the Ground Observer Corps had been on a 24-hour a day basis since July 14th, he asked that volunteers contribute 2 hours a week of duty at observation posts. "Since the military is not big enough to take care of the program," he said, "civil defense must be taken care of by civilians."

Proceeding to the Filter Center in the Pythian Building, the chapter was welcomed by Mrs. I. Harold Hammerman, director of the center's civilian personnel. Presentation of a very enlightening film, entitled "Air Defense," was followed by a first-hand glimpse of the operation of the board with explanations by Major Curtis.

Arrangements for the highly successful meeting were made by Arnold Wilkes, program chairman, who reported that he hoped to firm plans for other meetings at such places as: the Westinghouse Air Arm Division at Friendship Airport; the communications center at Annapolis; Fort Meade color photo lab; Bendix-Friez; a Coast Guard weather ship; etc.

Fifty-four members and guests responded to a "summons" to appear at the Maryland State Police Headquarters, in Pikesville, on December 9th for an inspection of the 14-state alarm system. Taken into custody they were divided into small groups to assure an orderly tour of the headquarters. Each group was shown the operation of the communication equipment, including the Handie-Talkie, and observed actual police messages coming through on the teletype machines.

A pre-meeting dinner was held at the Maryland National Guard officers' club. The chapter was welcomed by Capt. W. H. Conroy of the Maryland State Police who was introduced by Chapter President George Ruehl with a word of appreciation for his efforts in arranging the evening's program. Capt. Louis Bloom, chief of communications of the State Police, gave a brief description of the tour which was to follow.

Interest in the program stimulated a lengthy discussion period at the close of the tour—ample evidence of a very successful meeting.

Boston

Richards W. Cotton, chairman of the Electronics Production Board, DPA, and director of the Electronics Division, NPA, addressed the November 13th chapter meeting on the current and future aspects of the electronics procurement program.

The chapter reports the meeting was outstanding for the interest and enthusiasm generated by Mr. Cotton's speech which was "one of the best presentations of the electronics production picture, packed with information and good sense, and enlightening to industrial members in the New England area who have difficulty in seeing the whole picture."

Membership in the Boston Chapter has steadily increased to an all-time high as a result of the very fine programs presented this year.

At Decatur's Dinner-Dance: Chester Badgett, 1952 secy.-treas., Decatur Chapter; Col. George P. Dixon, executive secy., AFCA; David W. Richardson, 1953 secy.-treas.; William C. Thompson, newly elected president.

Chicago

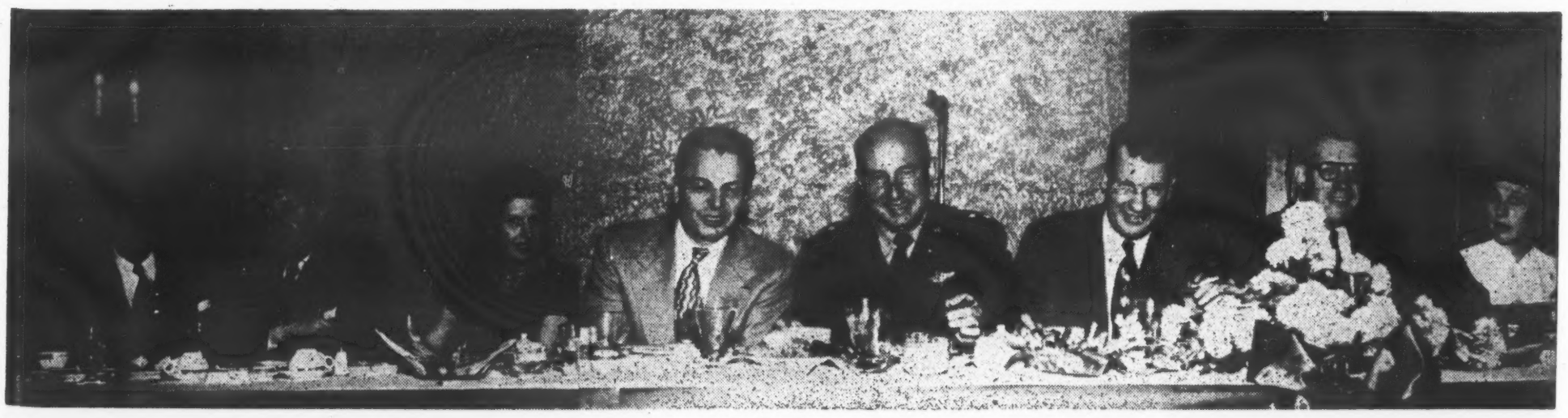
De Forest's Training, Inc., a school for television and electronics, was host to the Chicago Chapter on October 30th. The program for the meeting comprised dinner, an illustrated technical paper, and an explanation and tour of the school and its facilities.

Presiding over the meeting in the unavoidable absence of Chapter President James H. Kellogg was William C. DeVry, vice-president, who was host to members and guests at a pre-program reception, acting in his capacity as an official of the school. The meeting was well attended, and guests included executives from the personnel departments of many Chicago companies interested in recruiting, and naval officers from the electronics school at Great Lakes, Ill., interested in instruction techniques.

Following an excellent dinner, the group saw a presentation and demonstration of magnetic sound application to the U. S. Armed Forces 16mm projection equipment, given by John S. Powers, electronics development engineer of DeVry Corporation, as prepared in conjunction with Ellis W. D'Arcy, chief engineer of DeVry. The presentation featured both voice and music recorded on film for a new projector, using either tape recording on a magnetic stripe painted on the film, or photographic sound recording. Foreign language insertions for films to be used in NATO work are obvious applications of the added tape recording track. All projectors are made to play back either magnetic or photographic sound recording, but it is necessary to have special units only for making the recording as a precaution against unauthorized additions to the film.

Members of the De Forest's Training organization who outlined the school's functions were: Theodore J. Lafeber, vice president; W. N. Littlewood, director of education; O. I. Thompson, superintendent; and Joseph J. Gershon, supervisor of the engineering department. Courses offered by the school range in duration from 48 to 108 weeks, and embrace the essential mathematics and theory involved in the technology of television and industrial electronics, nuclear instrumentation, and electronic design. In addition to the scientific and practical aspects of the curriculum, the school's policy covers student welfare during his training and assistance in exploring employment opportunities while training

Shown at Dayton-Wright's annual dinner meeting at Wright-Patterson AFB, l to r: AFCA Executive Secretary George P. Dixon; Pat Deluhery; Mrs. Deluhery; Col. Steve Gadler; Maj. Gen. M. E. Bradley; Chapter President Paul Clark; AFCA President W. W. Watts; and Mrs. Paul Clark.



New officials of the Cleveland Chapter shown with Executive Secretary Dixon at December meeting. L to R: T. F. Peterson, secretary; E. H. Guilford, director; Col. Dixon; and Al Gross, President.

and after graduation. Recently the school has added a special course for women interested in the technical aspects of radio and television.

Chapter members and guests formed into small groups for conducted tours of the school actually in session. They saw students working out their individual designs for circuit problems in the laboratories, learning basic theory in the classrooms, and receiving instructions by means of the latest audio-visual educational techniques. Modern broadcast and TV studio equipment was being used to familiarize students with its operation, control and electrical characteristics.

The visitors were impressed by the amount and high quality of instrumentation made available for student use, and by the depth of training built into the courses. It was evident that the school's 21 years of experience in teaching enable it to perform an important function in electronics training, not only useful to the graduates but also contributing to both civilian and military elements of industrial mobilization.

Cleveland

At a reorganization meeting on November 25th, Al Gross of Royalcall, Inc., whose efforts were responsible for the renewed interest in the AFCA in the Cleveland area, was elected president of the Cleveland Chapter, with T. F. Peterson of Preformed Line Products chosen as secretary-treasurer.

The new Board of Directors consists of C. H. Endress, Willard Storage Battery; E. H. Guilford, Cleveland Institute of Radio Electronics; Al Gross; Col. F. H. Menagh, supt. of communications, Erie Railroad; T. F. Peterson; Howard R. Roe, Telkor; and L. K. Wildberg, president of Radiart Corporation.

Committee chairmen were appointed as follows: program—Al Gross; membership—E. H. Guilford; hospitality—John Sefing of Cadillac Tank.

The first dinner-meeting marking the resumption of chapter activities was held on December 11th at the Cleveland Engineer Society, with Col. George P. Dixon, AFCA National Executive Secretary, as guest speaker.

Col. Dixon traced the history of the association from its early beginning immediately following the Civil War, down through the Spanish American War and World Wars I and II. His informal talk covered suggestions for making the Cleveland Chapter one of the outstanding units of the association, stressing the importance of frequent and well-planned meetings in order to hold and build up local interest. He also suggested that an industrial relations committee be formed to bring in a greater representation of industrial and group members in the Cleveland area.

Dayton-Wright

An attendance of 200 marked the annual fall dinner-meeting at Wright-Patterson Air Force Base on October 22nd. National AFCA President W. W. Watts in the principal address of the evening discussed the problems that exist in the electronic industry today and presented industry's viewpoint on working with the military. Col. George P. Dixon, AFCA Executive Secretary, gave an up-to-date report on association activities together with a brief resume of plans for the annual convention scheduled for Dayton in May.

Among the distinguished guests present were: Maj. Gen. M. E. Bradley, USAF, who welcomed the group to Wright Field and heartily endorsed the value of such an organization to both military and industry; Brig. Gen. G. A. Blake, USAF; Mr. and Mrs. William Hine, executive office, small business, WPAFB; Col. and Mrs. E. C. Morrison, PIO, AMC; A. A. Farrar, manager, government contracts division, Raytheon; L. E. Osborne, executive vice-president of defense products, Westinghouse; B. M. Brown, sales manager of defense products, Westinghouse; L. A. Connelly, government sales manager, RCA; and H. D. Knapp, manager, government field group, RCA.

The major portion of the chapter's November 20th meeting was devoted to learning how communications apply to commercial flying, with Mr. E. Bennett, senior sales representative of the local Trans World Airlines office, and Ed Zavrel, local station manager, as the instructors. An extremely interesting film, "Overseas Run," depicted the close contact between a plane enroute to Europe and its destination across the ocean. At the close of the program, Messrs. Bennett and Zavrel answered many questions from the audience.

The drawing of the raffle for the 21" RCA Westland model television, radio and phonograph combination, for which chapter members had been selling tickets during the past month, was the last item on the program, with F. Rodgers of Havertown, Pa., the lucky winner. Total net profit of the raffle, which will be used for expenses in connection with the national convention, was $290.25.

Fort Monmouth Chapter's November meeting. At left, L. F. Christianson, outgoing vice-president, congratulates Col. Joseph E. Heinrich, newly elected president of the chapter. Shown at right are, l to r: A. D. Shaw, ASESA; Esther L. Ferneau, chapter treasurer; and Lt. Col. Arthur L. Gaskill, guest speaker.

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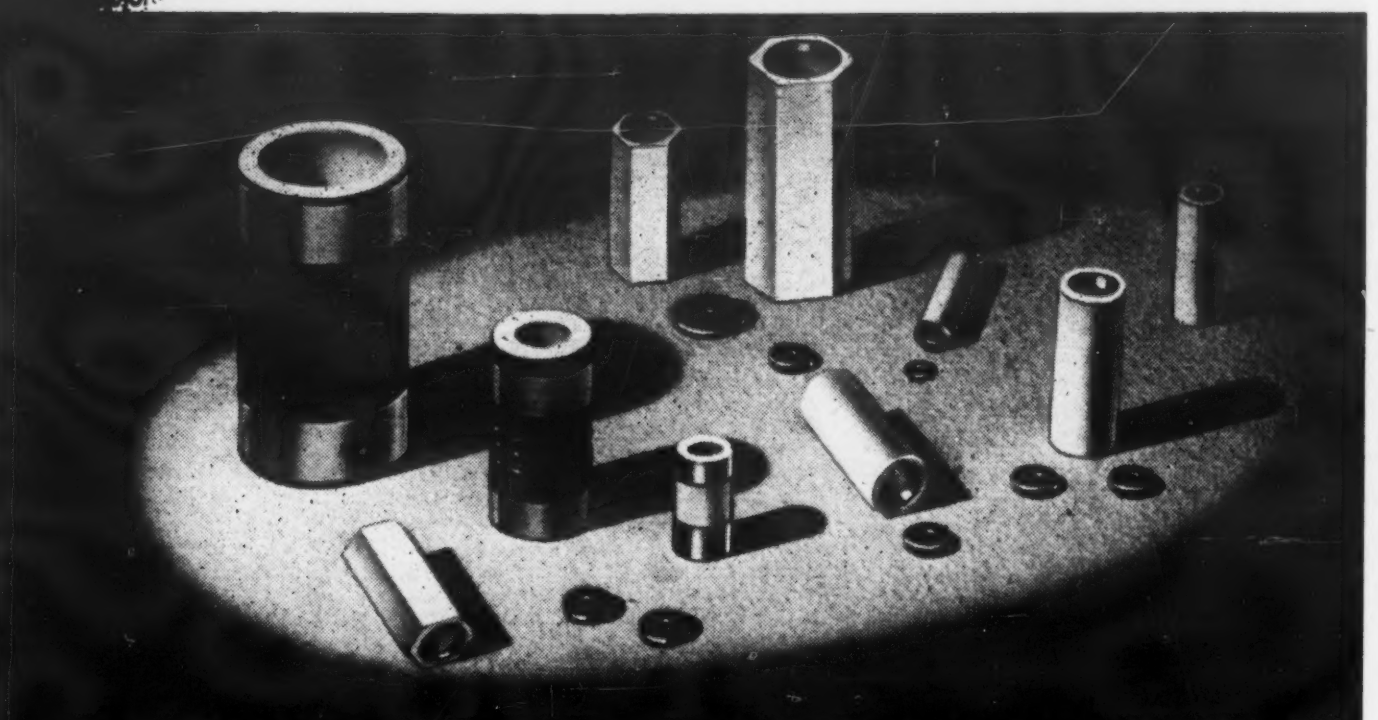
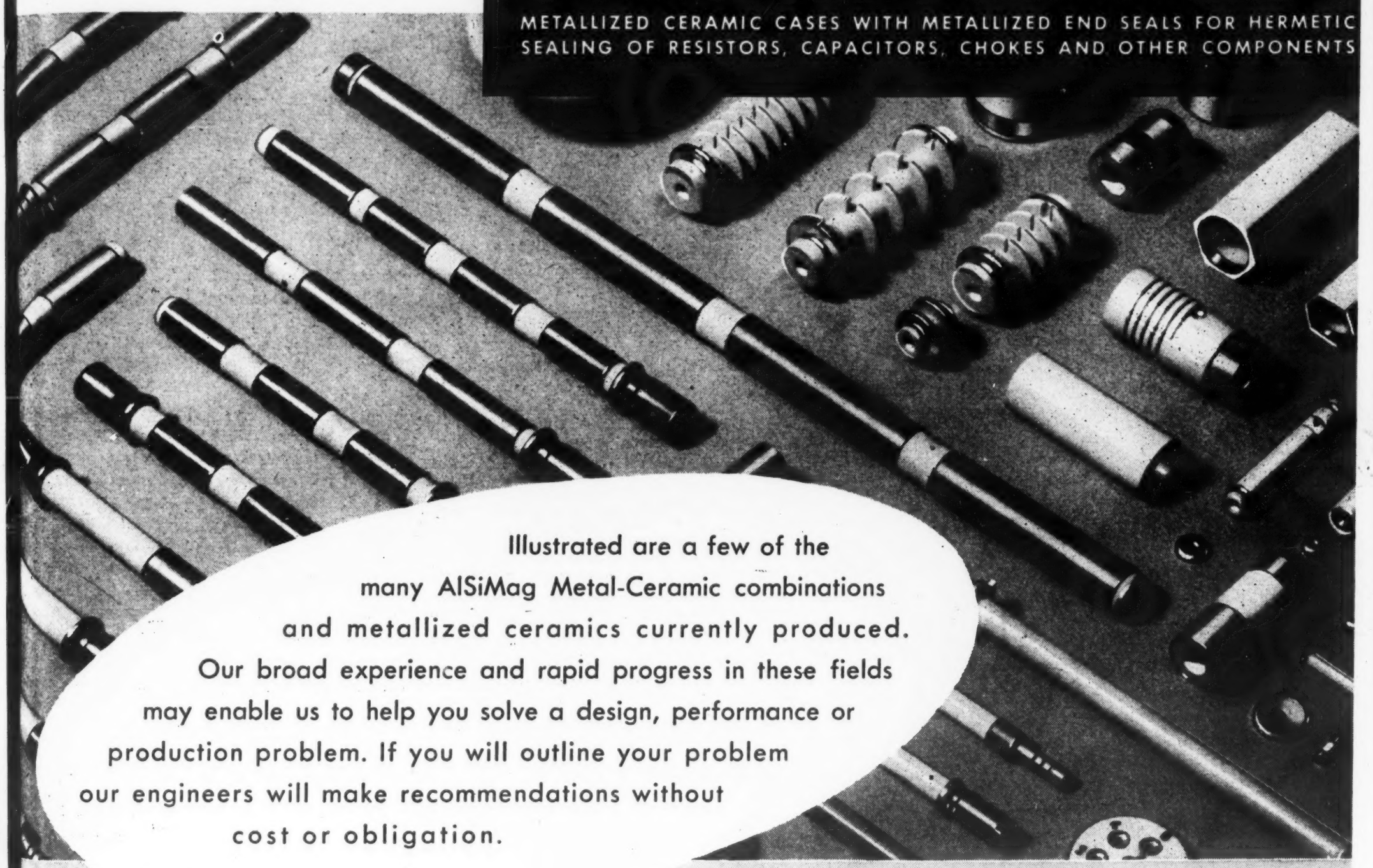


METALLIZED CERAMIC CASES WITH METALLIZED END SEALS FOR HERMETIC SEALING OF RESISTORS, CAPACITORS, CHOKES AND OTHER COMPONENTS



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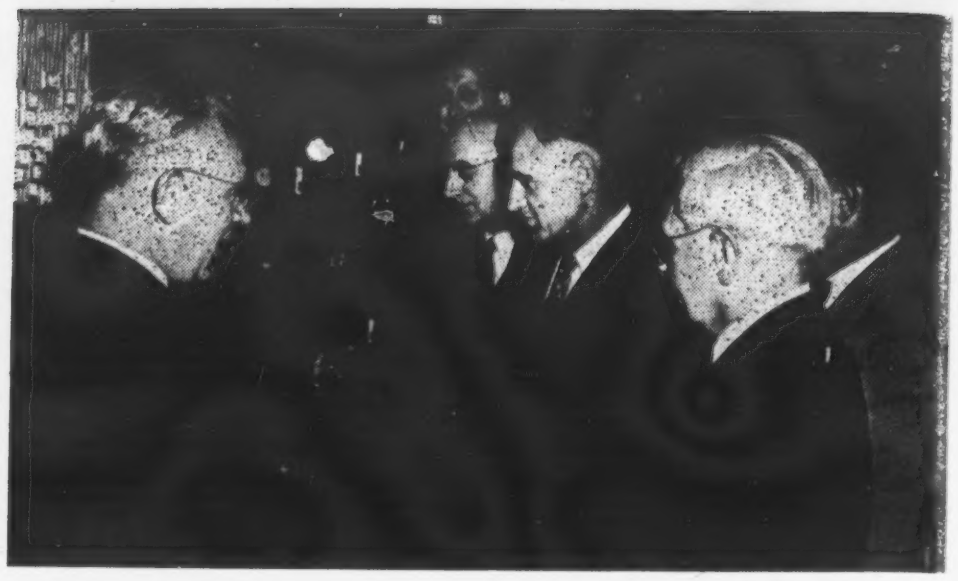

Kansas City Chapter members toured the Western Union Telegraph Company switching center on October 13th. At left, Jim Holt, maintenance supervisor, explains the automatic switching equipment; and, at right, Carleton Buell, traffic manager, instructs another group during the tour.

Decatur

Programs for the chapter's first two meetings in the fall were provided by group members of the association. Luther Couillard, chief of receiver development, Collins Radio Company, Cedar Rapids, Iowa, presented a lecture-demonstration on new receivers being developed for the armed forces at the September meeting; and Glenn Ruggles, sales engineer of Automatic Electric Company, gave an illustrated lecture on "Toll Ticketing" at the October meeting.

Mr. Couillard's lecture-demonstration covered the new receivers developed by Collins Radio to replace the BC-312. He also displayed a 51J or 388/URR and the new R-390/URR receiver, one of the pilot experimental units which is not yet in production. The development, stability, ruggedness and accuracy of the sets, which are adaptable to radio teletype, were thoroughly explained.

At the close of his leeture, Mr. Couillard showed a color film of the new Collins aircraft communication equipment which is being used by some of the major airlines. The film detailed the operation of the equipment on a flight from Rock Island, Ill., to Des Moines, Iowa, and demonstrated the simplification and elimination of various dials and controls as compared to other systems.

In discussing "Toll Ticketing," Mr. Ruggles illustrated the use of IBM cards for recording and billing toll calls of subscribers automatically, taking the Greater Los Angeles, California, area as an example. This system of toll ticketing by IBM eliminates switchboard operators as the hunter and selector relays automatically seek open trunk lines from station to station. The complex system installed in the Los Angeles area, with its many suburban communities and various associated companies, vividly illustrated how it simplifies toll calling and eliminates the operators required by the companies' central offices.

During the meeting, gold lapel buttons for signing up ten new members each were presented to Howard Baldwin, Donald Howe and John Wallett.

Annual elections were held at the November 20th meeting, with the following new officers chosen for the year 1953: president—William Thomson; 1st vice-president—Chester Badgett; 2nd vice-president—Eldo Coffman; secretary-treasurer—David Richardson. Directors elected for a two-year term were Lester Carter and Mons Monson, with the following directors continuing in office: Roman Wojcicki, Capt. Clarence McGowan, Robert Bangert and Elmer W. Cupp.

Two films, "Radiation Detection Instruments" and "Thunderbolt Hunters," were presented by Karl Rayburn during the program portion of the evening.

An interesting address on communications within the human body and its nerve system was presented by Dr. Herman Dorn, noted research chemist, before the December 6th dinner-meeting. Col. George Dixon, AFCA Executive Secretary, was a special guest of the chapter. He reviewed the history of the association, which was of interest to the old as well as the new members present, and reported on the current activities of the association and its chapters throughout the country.

Chapter President Roman Wojcicki presided at the meeting, with Elmer Cupp, chairman of the meetings committee, serving as master of ceremonies. With a dance following dinner, the evening proved so enjoyable that many members have asked the chapter to schedule more functions of this type in 1953.

Fort Monmouth

Increased attention to the role of photography in communications has been paid by a number of AFCA chapters this fall with photographic experts featured at various meetings. Fort Monmouth concentrated on photography at its November 19th meeting, with Lt. Col. Arthur L. Gaskill, staff photographic officer, G-3, as guest speaker.

Col. Gaskill, who was responsible for motion picture coverage of the conferences at Yalta and Potsdam, the signing of the Japanese peace treaty aboard the battleship MISSOURI, and the atom bomb tests at Bikini, gave a vivid account of photographic coverage from the military angle. Two motion pictures were shown—one on the role of the combat photographer and the services he performs for intelligence, training and historical record; the other was a newsreel of the D-day invasion of Normandy in World War II.

The annual election of officers was held during the business meeting, with the following result: president—Col. Joseph E. Heinrich; 1st vice-president—Morris Keiser; 2nd vice-president—A. A. Powell; secretary—Lt. Col. Lynnford S. Wilson; treasurer—Miss Esther M. Ferneau. Directors are: Arthur L. Adamson, Cdr. Charles L. D. Allen, Col. John W. Atwood, Col. Carl A. Borgeson, Col. Orman G. Charles, Maj. Earl J. Dotson, CWO Ed. J. Gwalinski, Edward L. Nelson, Lt. Col. Rex W. Radsch, Norman J. Schwartz, M/Sgt. Clifton Van Note and Dr. Edw. G. Witting.

Gulf Coast

Chapter actiivties resumed on November 17th with a dinner meeting at the Broadwater Beach Hotel in Biloxi attended by 96 members and guests.

Reports on plans for the year were submitted by committee chairmen who are as follows: program—Maj. James J. Mahon, Jr.; membership—Lt. Col. Byron H. Gilmore; finance—Maj. John J. Simon; publicity—Lt. Col. Marcus Satisky. A regular meeting will be held each month and will feature varied types of programs to interest the entire membership. A membership drive has been put in motion to increase the chapter strength.

Lt. Col. Joe Beler presided for the first time in his capacity as the new chapter president and the reports are that the outstanding feature of the entertainment program which followed dinner was his display of extraordinary (and heretofore unsuspected) talent as master of ceremonies.

Television was the subject of the December 16th meeting, with officials of Station WLOX, Biloxi, as guest speakers.

Duscussing the aspects of television in the Gulf Coast area, Ray Butterfield, manager of the station, covered in detail the various stages involved in obtaining an FCC permit to operate a television station. Technical details as to power output, location of antenna, and a general description of the type of transmitting equipment were submitted, as well as estimates of the grade A and grade B coverage of the local station when installed. The financial involvements in a project of this type were pointed out by Jimmie Love, principal owner of station WLOX. He also gave a general account of the television station in Jackson, Miss., in which he is interested

and outlined the differences between the two stations in Jackson and Biloxi, the major one being occasioned by the greater populated area to be covered in the Jackson section.

Before presenting the television speakers, Program Chairman James McMahon introduced Conway Dabney, chapter member, who delighted the meeting with a few humorous personal experiences and then briefly gave his concept of the government spending program.

Dinner was followed by dancing and the evening was termed a great success by the one hundred members and guests present.

Kansas City

The Western Union Telegraph Company was host to the chapter on October 13th. Following a talk on the relay center by Carleton L. Buell, traffic manager, the forty-five members and guests were conducted in small groups on a tour of the telegraph switching center.

The program also included a Western Union film, entitled "Telegrams for America."

With members of the AIEE and IRE as their guests, the chapter met on December 1st to hear E. C. Thelemann, representative of the Federal Communications Commission at the headquarters of the Civil Air Defense Force, speak on the subject of "Control of the Electromagnetic Radiation (Project CONELRAD)."

Mr. Thelemann illustrated his talk with slides and gave an excellent picture of the proposed operation of radio broadcasting stations in the event of an air attack.

The meeting was held in the Edison Hall of the Kansas City Power and Light Company Building and was attended by sixty members and guests.

Kentucky

The annual election of officers was held at the chapter's November 5th luncheon meeting with the following result: president—Col. Fred W. Kunesh, commanding officer, Lexington Signal Depot; 1st vice-president—Harry J. Huether, Jr., president of the General Telephone Company of Kentucky; 2nd vice-president—Don Freeman; 3rd vice-president—Capt. Glidewell R. Grammar; secretary—Clyde T. Burke; treasurer—M. L. Whitmer; asst. treasurer—Mrs. Mary Steffens.

Col. Kunesh was guest speaker for the meeting and gave a very interesting talk on conditions in Europe since World War II.

Held in the post restaurant of the depot, the meeting was attended by 122 members and guests, with Chapter Vice-President Harry Bradshaw presiding. Program arrangements were made by Lt. Joseph Herberts, program chairman.

New York

Governor's Island was the scene of the chapter's October 29th meeting held in honor of Maj. Gen. George I. Back, Chief Signal Officer, who was the principal speaker of the evening.

General Back's address on the "Signal Corps Today" was of such interest to New York Chapter members that it is printed in its entirety on page 20 of this issue for

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Donald F. McClure, newly elected president of the New York Chapter.

Robert T. Bartley, FCC, guest speaker at New York's November meeting.

The New York Chapter's October 29th meeting at Governors Island was held in honor of Maj. Gen. George I. Back, Chief Signal Officer of the Army. Shown above are, l to r: Col. F. E. Kidwell, Signal Officer, First Army; Maj. Gen. H. C. Ingles; General Back; and Col. T. F. Bartlett, chapter president.

the benefit of the entire AFCA membership. The general prefaced his talk with an informal description of his own experiences at the outbreak of the Korean difficulties in June 1950 when he was stationed in Japan as Signal Officer of the Far East Command.

Also guest of the chapter was Col. George P. Dixon, AFCA Executive Secretary and one time president of the New York Chapter, who reported on the overall activities of the association and its chapters.

The evening commenced with a cocktail party, followed by an excellent dinner arranged by Col. F. E. Kidwell, First Army Signal Officer. The meeting was opened by Chapter President Ted Bartlett reading letters of greeting from Lt. Gen. W. D. Crittenberger, Commanding General, First Army, and Maj. Gen. F. L. Ankenbrandt, Chief Signal Officer, SHAPE.

Attendance at the meeting was well over 200 and included many executives of the communications and radio manufacturing industries, such as the Bell System, IT&T, Federal Telephone & Radio Corp., RCA, Western Union, etc.

The difficulties which face the staff of the Federal Communications Commission in their attempts to process a heavy backlog of work with insufficient personnel were outlined by Robert T. Bartley, FCC Commissioner, at the chapter's November 17th meeting. His topic, "The Plugged Nickel," referred to the "amount of money the FCC is furnished each year . . . to administer the Communications Act."

Broken down on a per capita basis, the Commissioner said the yearly budget of the FCC figures out as "4.077 cents per annum for each man, woman and child in the United States." With this "plugged nickel," he added, the Commission is "supposed to regulate interstate and foreign commerce in communications by wire and radio . . . to make available a rapid, efficient, nationwide and worldwide communications service . . . at reasonable charges for promoting safety of life and property through the use of wire and radio communication."

To picture the wide discrepancy between the administrative and engineering work involved and the inadequate staff that must handle the assignments, Commissioner Bartley outlined the scope of the various FCC bureaus and enumerated the personnel assigned to each. As one example, he called attention to the Common Carrier Bureau which in 1934 had about 140 employees compared to only 109 today. The Safety and Special Radio Services Bureau, which handles the great majority of licensed stations has fewer than 100 persons, and this group, the Commissioner said, will process 141,000 applications in the current fiscal year, yet a backlog of 9,500 applications continues to exist.

In commenting on Commissioner Bartley's address, Col. T. L. Bartlett, Chapter President, urged a continuing spirit of understanding and cooperation by the industry in its relations with the FCC in view of the situation which confronts its seven commissioners and staff today.

Held at Schwartz's Restaurant in downtown New York, the meeting was preceded by cocktails and dinner, with 136 members and guests present.

At the annual elections on December 17th, Donald F. McClure, assistant vice president of the New York Telephone Company, was elected president of the chapter for 1953. Mr. McClure will begin his term with chapter membership at a record high as a result of his efforts as chairman of the membership committee during the past year. Other officers elected were: vice-presidents—Vice Admiral W. S. Anderson, Automatic Electric Co.; Forest L. Henderson, All American Cable & Radio Corp.; Col. F. E. Kidwell, Signal Officer, First Army; treasurer—Maj. T. N. Pope, Bell Telephone Labs.; secretary—Lt. Col. David Talley, Federal Telephone & Radio Corp.; recording secretary—Royal F. Jewett, Western Electric; member executive committee—past president T. L. Bartlett, RCA.

Directors were chosen as follows: George W. Bailey, IRE; T. L. Bartlett; Edward L. Carlson, Mutual Life Ins. Co.; Lt. Col. W. L. Hallahan; Vice Adm. Carl Holden, Federal Telecommunication Labs.; Maj. Gen. H. C. Ingles, RCAC; F. R. Lack, Western Electric; Brig. Gen. A. W. Marriner, Federal Tel. & Radio; Col. T. H. Mitchell, RCAC; Col. Benjamin H. Oliver, New York Telephone Co.; Rear Adm. S. F. Patten, Dumont Labs.; Raymond S. Perry, Federal Telephone & Radio Corp.; Maj. W. H. Rivers, Eastman Kodak; and Lt. Col. E. R. Shute, Western Union.

Principal speaker was Herbert J. Schroll of the AT&T Company Long Lines Department on "Communications for Air Defense." Full report of the meeting will appear in the next issue of SIGNAL.

Paris

The first meeting of the new Paris Chapter was held on December 4th in the officers lounge at SHAPE headquarters with an enthusiastic group of 85 members and guests in attendance.

Chapter President John T. Quinn presided at the meeting after a word of introduction from Maj. Gen. F. L. Ankenbrandt, Chief Signal Officer of SHAPE, and vice-president of the chapter.

The meeting was preceded by a social hour and dinner. Among those present were: Brig. Gen. Ivan L. Farman, communications officer, AAFCE; French General Robert Brygoo, communications officer, ALFCE Hq.; Maj. Decker, Sec. of J. S. B. Central Europe; H. Postove, manager, Weisbaden office, Philco Corp.; Frank Crennan, manager, Frankfurt office, Philco Corp.

Chapter officers report the meeting was very successful in arousing interest in the chapter and its objectives and that they look forward to a promising year of activity.

Philadelphia

The chapter's annual winter dinner-dance was held at the Philadelphia Quartermaster Officers' Club on December 5th. (Report on the meeting had not been received as SIGNAL went to press.)

Pittsburgh

One hundred and thirty-five members and guests visited the RCA plant in Canonsburg, Pa., on November 18th. Dinner, served in the company cafeteria through the courtesy of the RCA people, was followed by a conducted tour of the plant.

The group was shown the many processes involved in the manufacture of AM and FM table models, as well as other radio

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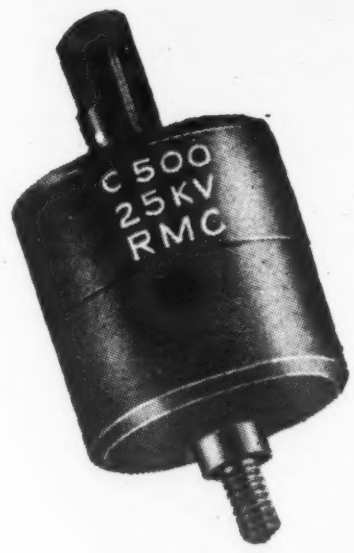

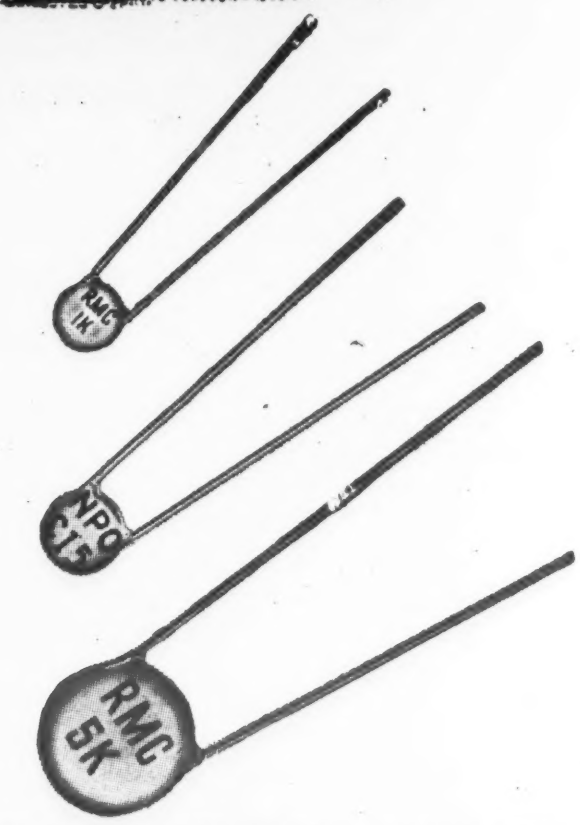

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equipment. After the tour, a film was shown depicting the background of UHF television.

Comments from those attending were that the evening's program was unusually well planned and most interesting.

Something new was tried this year by the Pittsburgh Chapter—a Christmas party. There were two reasons for this innovation: first, to give the new members an opportunity to meet the entire membership, and, second, to create greater interest in the chapter by including the wives.

The affair was held on December 13th in the Logan Armory and was a tremendous sucess, as proved by the attendance of 227. A caterer served an excellent buffet supper and an orchestra furnished music for dancing.

Arrangements for the use of the Logan Armory were made by Col. V. P. Lupinacci and the chapter reports it is greatly indebted to him, the Armory staff, and the program committee for the outstanding event.

Rochester

Mr. H. C. Barr, supervisor of the optical measurements division, field testing organization, Sandia Corporation, one of the major centers testing atomic weapons and components, talked to the Rochester Chapter on October 15th about the use of photographic instrumentation in connection with the atomic energy program of the Sandia laboratory.

Discussing field evaluation testing, Mr. Barr said: "Test equipment must be selected, commercial equipment modified as required, and when necessary new equipment developed, designed, and procured. Equipment used is electronic, mechanical or optical, and often is a combination of all three. Optical tracking and high speed photography are widely used. The results obtained from field tests must be available in facts and figures whose accuracy is equal to the accuracy gained in carefully controlled laboratory experiments, under ideally controlled conditions. This is the challenge of field testing."

He paid tribute to photographic equipment made in Rochester, remarking "You wouldn't believe what it will do—actually we take your maximum qualifications and make them our minimums. If I told you we are taking 1,800 frames a second on Kodachrome film without extra lighting, or the speed we get from the Fastex camera, you might think I am stretching the truth. Some of the results we get from photographic equipment are really unbelievable."

Mr. Barr said the testers use practically every type of camera among the hundreds assembled for various phases of the extremely exact testing operations, and vast amounts of film are used in preliminary and "dry runs" because it is much cheaper than having something go wrong in an actual test.

The audience saw evidence of the "beating" their products take in atomic tests when, at the close of his talk, Mr. Barr showed a film depicting actual tests. The film showed large supplies of equipment being readied on desert test sites, jet planes in action and atomic explosions. It also depicted quantities of sand being cleaned from cameras and other equipment after an underground explosion.

Scenes from the first meeting of the new Paris Chapter on December 4th at the officers' lounge of SHAPE headquarters.

L to r: Brig Gen. I. L. Farman, Col. Strasburger, Maj. Gen. F. L. Ankenbrandt, Col. Purviance, and John T. Quinn, president of the chapter.

A portion of the attendance at the dinner-meeting.

General Ankenbrandt looks on while President Quinn signs the attendance register. The new chapter charter is shown in the foreground.

Sacramento

With Brig. Gen. Clarence P. Talbot, deputy commander of McClellan Air Force Base, elected as its new president, the Sacramento Chapter resumed its series of regular meetings when it met on December 11th at the Sacramento Signal Depot officers' club to learn about some of the latest type of equipment being used by the Signal Corps.

The program was conducted by members of the Sacramento Signal Depot Maintenance Advisory Team, Station Liaison Office. Mr. Herbert Taylor, civilian head of the advisory team, reviewed its activities throughout the eight western states in the Sixth Army area. Mr. Eugene Whitby then explained and demonstrated the very latest type of communications equipment including the new Handie-Talkie radio sets and the larger power vehicular type radio equipment which will shortly replace numerous items of World War II communications equipment. A comparison was made showing the distinct advantages of the newer equipment and the audience had an opportunity to actually operate this equipment at the close of the program.

General Talbot, after accepting the gavel from retiring president Paul Carington, emphasized the need for increasing the membership to better enable the chapter to carry out its objectives. He also gave a very interesting talk on the part being played by communications and electronics in aviation, especially in the Air Force.

Special guest of the chapter was Col. Sidney N. Storbraaten, commanding officer of the Sacramento Signal Depot.

San Francisco

A description of the operation of the police and fire department radio systems and the fire department alarm system was presented at the chapter's December 4th meeting by Burton Dougherty, assistant chief of the department of electricity and communications of the city and county of San Francisco. Following his talk, the members proceeded to the San Francisco central fire alarm station six blocks away, where they were divided into groups to tour the station and learn about the operation of the communications system.

The meeting started with a "get acquainted" hour, followed by dinner at the Whitcomb Hotel, with forty-one members and guests present. Col. Lloyd Parsons, chapter president, introduced the new members after which the other members rose and introduced themselves. It was announced that the proposed chapter constitution which had been sent to all members several months ago had been approved by mail ballot. Several changes in the constitution had been suggested by national headquarters and, upon being submitted to the meeting, were unanimously approved.

Arrangements for the very successful evening were made by Major Thomas D. Razovich, chairman of the program committee.

Scott-St. Louis

"Mobile Press Communications" was the subject of a talk by Earle E. Eldredge of the physics laboratory of Sylvania Electric Products, Inc., who was formerly chief engineer of Press Wireless, Inc., on Nov. 7th.

Mr. Eldredge traced the history of press communications from the beginning of World War II, describing the first mobile press unit used during the Normandy invasion, and emphasized the importance of this phase of communications in both the European and Pacific theaters. He told several dramatic stories which illustrated the type of problems, both technical and otherwise, encountered in providing and maintaining efficient press communications. The technical characteristics of a press-wireless communications system were described, as well as a most interesting system called "Moduplex" in which voice modulations are superimposed on the carrier for radio teletype and transmission conduced simultaneuosly.

Sixty-five members attended the buffet dinner at the Elks Club in Belleville, with one hundred and two members and guests present at the meeting which followed.

The chapter celebrated its first anniversary on December 5th with AFCA's top executives, W. W. Watts, National President, and Col. George Dixon, Executive Secretary, as guest speakers. Lt. Gen. Robert W. Harper, commanding general of the Air Training Command, USAF, a charter member of the chapter, officially introduced the speakers to the gathering.

General Harper emphasized his belief in the importance of an association such as the AFCA and, particularly, its value and contribution to the activities of training bases such as Scott Air Force Base having electronics and communications training.

Washington Chapter President Joseph Redman, at right, introduces Rear Adm. William B. Ammon, center, Director of Naval Communications, as the main speaker at the chapter's November luncheon. At the left is Rear Adm. John R. Redman, Director, Communications-Electronics, JCEC.

He also praised the work of Col. W. N. Snouffer, the chapter's first president, who was recently transferred overseas.

President Watts stressed the mission of the association in its three fields of interest—communications, electronics and photography—and gave a report on the overall progress made by the AFCA to date. He also gave the audience an insight into technical developments which will be forthcoming in the not-too-distant future, including a number of pushbutton gadgets being developed for the housewife—some of which will even watch the baby electronically.

Col. Dixon complimented the chapter on its outstanding year of activity, giving special credit to the chapter's former president, Col. Snouffer, and its hard-working secretary, Allan Eisenmayer. He also expressed his appreciation to General Harper for the support he is giving the AFCA in the Air Training Command.

Following the speeches, Howard Yund, publicity chairman, presented his film-slide review of the chapter's first year of activity. The slides covered every meeting held since the chapter was chartered and, with the appropriate commentary by Chairman Yund, provided a fitting climax for an evening of excellent entertainment.

The dinner-meeting, to which the ladies were invited, was attended by 125 members and guests.

Prior to the meeting, Clifford Wassal, defense activities engineer of the Southwestern Bell Telephone Co., and chairman of the chapter's industrial relations committee, held a committee meeting to discuss plans for overall chapter activities in regard to industrial relations.

Present were: Norman Kathrinus, Willard Evans, Albert Lenny, Jack Barnes and Mike Ebinger. Col. Owen H. Griffith and Theodore Lowell are also members of the committee but could not be present.

Seattle

The October 15th dinner-meeting was held at the Coast Guard barge, Pier 70, Seattle, with Capt. F. K. Johnson, captain of the port and vice-president of the chapter, as host.

The speaker of the evening, C. C. Lischke, manager of the local Mackay radio station, presented a very instructive session on development of antennas at his station which resulted in a considerable reduction in interference to radio reception due to noise and undesired signals.

The Civil Aeronautics Administration instrument landing system (ILS) was featured at the chapter's November 12th meeting, with Mr. W. R. Triplett, CAA radio engineer, in charge of the program.

With the aid of a film, Mr. Triplett described the system which is now in operation at many airports. He stated that ILS had been selected over the ground control approach (GCA) system as the primary landing aid after extensive tests had shown that it was more practical for general civilian use. He also said that search radar is now being installed to some extent as a supplementary aid. At the conclusion of his talk, Mr. Triplett answered numerous questions from the audience.

The meeting was held in the Chamber of Commerce Building. During a brief business session, Chapter President Frank Keyser announced the appointment of a nominating committee in connection with the annual elections in December, as well as a committee to review the chapter by-laws.

South Carolina

At its October 15th meeting, the chapter elected new officers for the year as follows: president—Lt. Glenn F. Decker, US Naval Base, Charleston; 1st vice-president—Thomas H. Stokes, Southern Bell Telephone & Telegraph Co.; 2nd vice-president—Frank S. Barnes, Jr., Rock Hill Telephone Co.; secretary-treasurer—Lt. Col. William R. Carter, Southern Bell T&T Co.

Guest speaker of the evening was Cdr. Paul R. White from the U. S. Naval Base at Charleston who discussed "Nucleonics" and included a brief outline of the steps being taken to combat atomic radiation.

The VFW Club in Columbia was the scene of the meeting and the supper which preceded it.

A lecture-demonstration on television was presented by T. A. Shea, public relations

Pittsburgh Chapter members were guests of the RCA plant in Canonsburg, Pa., on November 18th. Above, F. E. Stouffer, manager of the plant, points out details of a radio chassis during a tour of the plant's operations. In the center of the group is Ralph W. Will, chapter president.

manager for the Southern Bell Telephone & Telegraph Company in South Carolina, at the November 14th meeting held at the officers' club of the Charleston Navy Yard.

Mr. Shea gave a brief outline of the basic principles of television and the first methods used in transmitting pictures. He discussed the problems involved in long distance transmission of television and the methods employed by the telephone company, and followed with a demonstration of how light waves are transformed into electrical impulses and then back to light waves.

The new officers were presented by Capt. Henry McCarley, retiring president, and the new president, Lt. Glenn Decker, asked for the cooperation of all members in increasing the interest and activity of the chapter during the coming year.

"The History, Aims and Purpose of the AFCA" was the subject of a talk by AFCA's National Executive Secretary, Col. George P. Dixon, at the December 18th dinner-meeting. Col. Dixon covered the history of the association from the early days of the war between the states to the present time, and gave an up-to-date report on its overall activities. At the conclusion of his talk, he presented slides taken of the 1952 national convention in Philadelphia.

The Executive Secretary was introduced by Ralph S. Grist, AFCA's Southeastern area representative, who, together with John Owen, secretary of the Augusta-Camp Gordon Chapter, had accompanied Col. Dixon from Augusta where he had addressed the chapter there the previous day.

The dinner-meeting took place in the Columbia Hotel, Columbia, and was marked for its enthusiasm and interest. Over fifty members and guests were present, half of whom drove from Charleston for the occasion.

Washington

A capacity audience turned out to hear Rear Admiral William B. Ammon, Director, Naval Communications, discuss "The Navy's Contributions to Radio Communications" at the chapter's November 12th luncheon meeting.

From the Navy's first introduction to radio in 1899, when Marconi tested some of his wireless equipment aboard the U. S. Ships NEW YORK, MASSACHUSETTS, and PORTER, to the million-watt Navy transmitter now being completed at Snohomish County, Washington, Admiral Ammon unfolded the record of the Navy's contributions to the last half century of radio communications.

The many enthusiastic comments from Washington Chapter members concerning the Admiral's talk make its publication in SIGNAL a "must" and it will appear in an early issue so that all members may enjoy this excellent summary of the Navy's accomplishments in the fields of main interest to the AFCA.

Guests at the head table were presented by Rear Adm. Joseph R. Redman, chapter president. They were: Haraden Pratt, telecommunications advisor to the President; Rear Adm. John R. Redman, Director, Communications-Electronics, JCEC; and the following representation from the Navy: Rear Adm. Joseph N. Wenger, Capts. R. R. Hay, J. A. Morrison, G. K. Carmichael, T. L. Greene, D. C. Beard, M. F. Bowman, F. G. Raysbrook, G. H. Hamilton, P. R. Anderson, L. S. Howeth, and F. R. Furth.

President Redman also introduced the following members in the audience: Maj. Gen. George I. Back, Chief Signal Officer; Brig. Gen. J. D. O'Connell, Deputy Chief Signal Officer; Maj. Gen. D. A. L. Wade, telecommunications attache, British Embassy; George Ruehl, president of the Baltimore Chapter; and Rear Adm. Stanford C. Hooper who presented as his guest, Congressman Carl Hinshaw of California, member of the Interstate Foreign and Commerce Committee.

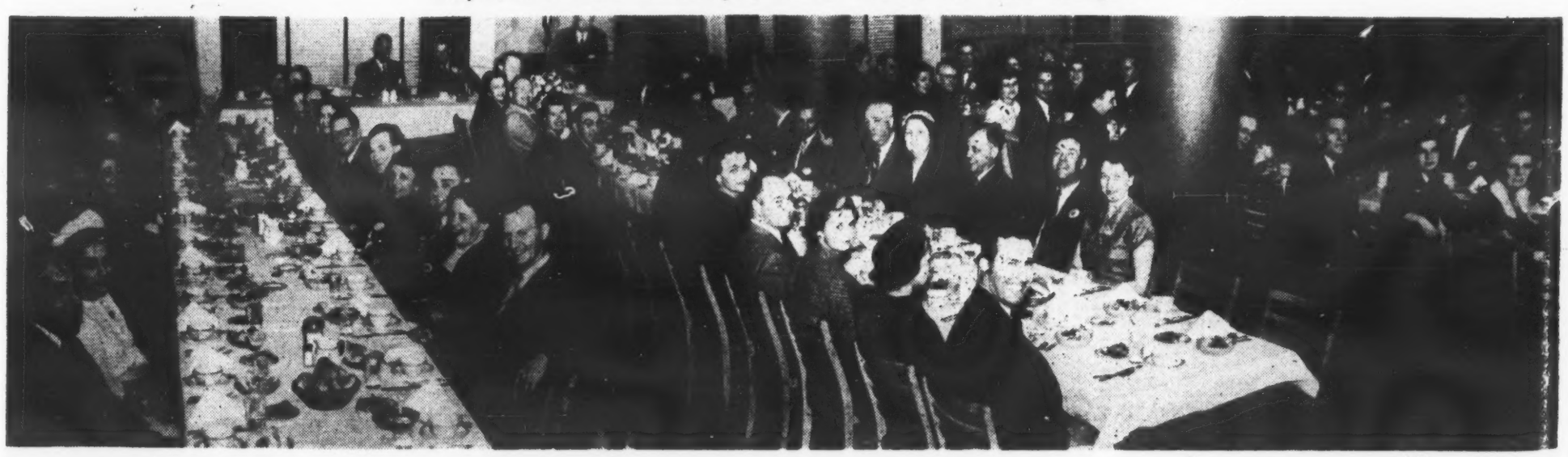
Washington Chapter membership, which has been growing steadily since the fall, has now reached a record high, with the chapter ranking as the second largest in the association. Credit for the excellent growth in interest and strength is due to the leadership of President Redman, the hard work of Chapter Secretary James F. Coll of Western Union, and the efforts of the membership chairman, Philip R. Watson of P. R. Mallory Co.

Northeastern University

A student chapter was organized at Northeastern University, Boston, Mass., in December, with a charter membership of fifty-six students. 1st Lt. Frederick H. Griswold of the Signal Corps ROTC staff is serving as advisor to the chapter.

Chapter officers have been elected as follows: president—Jerrold D. Atlas; vice-president—John R. Cressey; secretary—James C. Manning; treasurer—Robert J. Kates, Jr.

Scene at the first anniversary dinner-meeting of the Scott-St. Louis Chapter on December 5th at which AFCA President W. W. Watts and Executive Secretary George Dixon were guest speakers. At the headtable are, l to r: Col. Dixon, Lt. Gen. Robert W. Harper, Allan Eisenmayer, Mrs. Allan Eisenmayer, W. W. Watts, and Mike Ebinger.



Folsom Predicts Marked Expansion In Television

Frank M. Folsom, President of the Radio Corporation of America, in a year-end statement said that between 150 and 200 new television stations are expected to go on the air in 1953, bringing approximately five million additional families within TV program service range.

On the basis of this expectation, plus the replacement market, he said, it is believed that the industry will distribute approximately 6,250,000 new television sets in 1953.

Mr. Folsom said that the annual "going rate" of the radio-television industry is now estimated at $5 billion, and that analyses of market potentials indicated a continuing upward trend in 1953, with the industry rate approaching $6 billion during the latter part of the year.

"Equipped with the greatest production capacity in its history, the radio-television industry is successfully meeting the dual requirements of manufacturing for the national defense and the domestic market," he stated. "In RCA, this is largely due to the outstanding teamwork of employees and the splendid cooperation of suppliers.

"While defense production formed the bulk of the industry's output in 1952, television continued to be the major factor in the civilian field. The 6,000,000 television receivers produced during the year added more than $1 billion to the industry's gross income.

"America's overwhelming acceptance of television as one of our most powerful mediums of entertainment, culture, and news is shown by the fact that, in the last six years, the public's investment in TV receivers alone amounts to more than $9 billion. This represents an unparalleled achievement. It involved the manufacture and distribution of approximately 23,000,000 television sets, of which nearly 21,000,000 are in use today."

Production Highlights

Mr. Folsom noted that along with television's growth, the public's interest in radio broadcasting "continues firm," with distribution of 9,000,000 radio sets achieved in 1952 and expectation of producing that many in 1953.

Concluding, Mr. Folsom said: "The electronic symbol is a bright and guiding star that challenges sciences and industry to advance into new fields of endeavor, to create, and to improve with quality and efficiency as the standards."

At a recent meeting with General Dwight D. Eisenhower, then President-elect, William C. DeVry, president of the DeVry Corp., and vice president of the AFCA Chicago Chapter, was pleasantly surprised to learn that Gen. Eisenhower was a great advocate of the use of motion pictures for educational, as well as morale-building purposes. General Eisenhower also discussed sound movies as a very newsworthy source of bringing pictures in the armed forces from one theater of war to the other, so that both officers and men could not only observe their friends, but learn how they were using certain methods to good advantage.

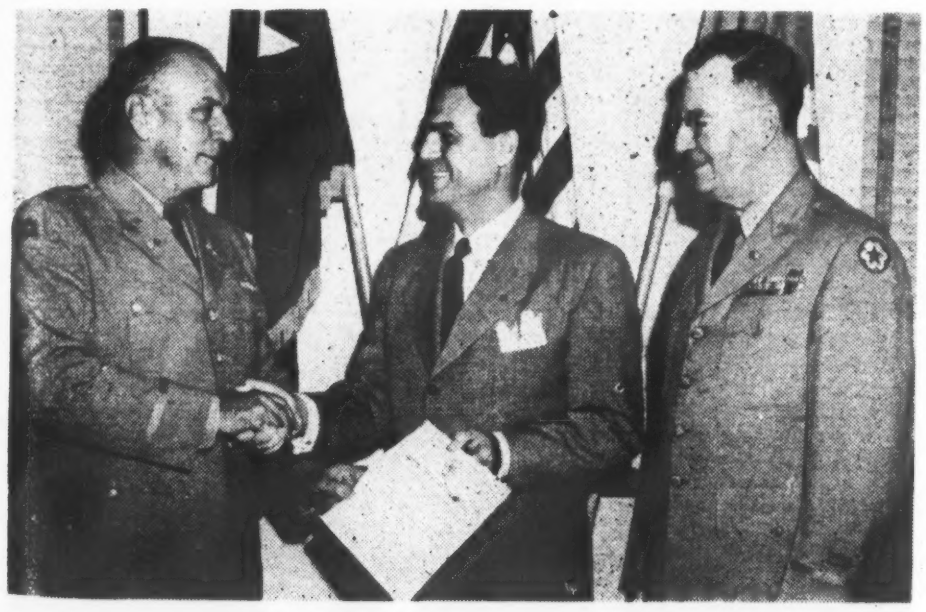
L-R: General Dwight D. Eisenhower; T. J. Lafeber, general manager of De-Forest's Training, Inc., one of America's largest television training centers, another DeVry institution; E. B. DeVry, vice president of DeVry Corporation; and William C. DeVry.

COMMUNICATIONS INSTRUCTOR

Instructors in communications subjects are needed at the Southwestern Signal Corps Training Center, San Luis Obispo, the Twelfth United States Civil Service Region.

Entrance salaries pay $4,205.00 and $5,060.00 a year. Instructors are needed in high-speed radio operation, field radio repair, fundamentals of electricity, power unit installation and maintenance, wire cable splicing, wire carrier and repeater systems, message center, manually operated central office switchboard, and teletype operation and maintenance.

Applications should be sent to the Board of U. S. Civil Service Examiners, Southwestern Signal Corps Training Center, Camp San Luis Obispo, Calif. Applications and additional information may be obtained from the civil service secretary at first- and second-class post offices, or from the office of the Director, Twelfth United States Civil Service Region, 630 Sansome Street, San Francisco.



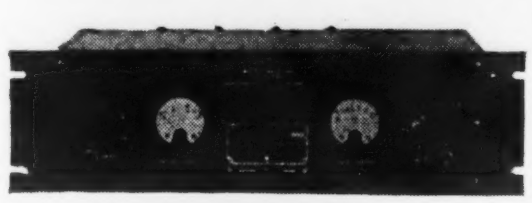
At a ceremony held recently in the office of the Chief Signal Officer of the Army, Maj. Gen. George I. Back, Mr. Bruce Quisenberry received the Army's Meritorious Civilian Service Award. L-R: General Back congratulates Mr. Quisenberry as Brig. Gen. J. D. O'Connell, Deputy Chief Signal Officer, looks on.

SAFEGUARD ELECTRONIC EQUIPMENT

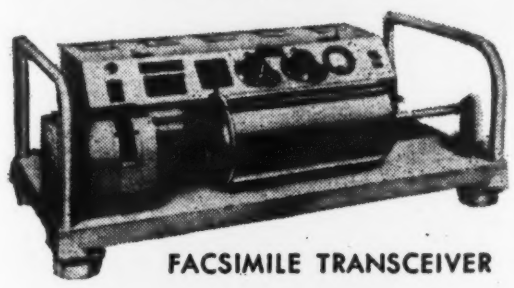
Specify CARGO PACKERS

-for packaging delicate instruments!

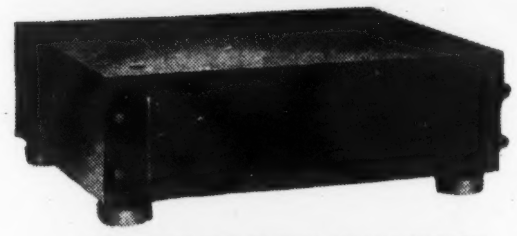
NEW CARGO PACKERS TECHNIQUES ASSURE SAFE ARRIVAL OF THE MOST SENSITIVE ASSEMBLIES



KEYER ADAPTER



FACSIMILE TRANSCEIVER



FREQUENCY SHIFT CONVERTER

FACSIMILE RECORDER

Complete facilities and years of experience in specification packing for

SIGNAL CORPS
AIR FORCE
NAVY

Economical, efficient handling assured by

- SPECIAL PACKAGING EQUIPMENT
- EXPERTS IN MILITARY REQUIREMENTS
- ASSEMBLY LINE METHODS
- COMPLIANCE TO ALL DETAILS
- COMPETENT ADVISORY SERVICE

Specifying Cargo Packers for complete packaging service means thorough, dependable protection for the most fragile equipment. You save valuable floor space, costly machines and the need for trained packaging personnel. Cargo Packers production line methods save time, detail work, costly errors and money! The new illustrated brochure explains the service in detail. Requests for copies will receive prompt attention. Ask for a copy, now!

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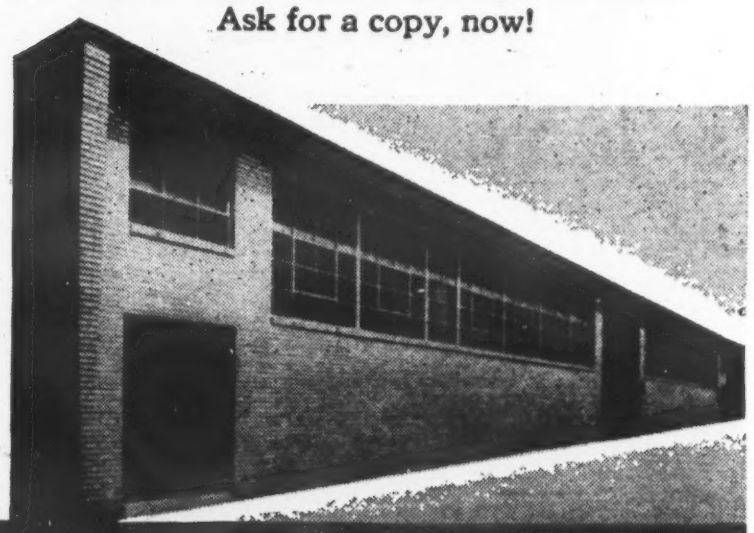
CARGO

CARGO PACKERS
INCORPORATED
73 RUTLEDGE STREET
BROOKLYN 11, NEW YORK



SPECIALISTS IN CLIMATE PROOF PACKAGING FOR THE ARMED FORCES AND INDUSTRIAL ORDNANCE

GE Produces Hydrogen Thyratrons for Defense

General Electric recently announced plans for production of a type of electron tube vital to the operation of high-power radar units for the nation's radar fence being built by the United States Air Force.

The tubes, known as hydrogen thyratrons, have never been available in sufficient quantities, but beginning this month G. E. will build several million dollars worth annually at the company's Scranton, Pa., plant.

The Scranton plant is now being converted from production of dishwashers to electron tubes. Production of hydrogen thyratron tubes will be the first tube production in the plant.

The tubes to be built in Scranton are necessary to control the output of the radar signal in high-power radar units. Several types of hydrogen thyratrons, including the type to be made in Scranton, were developed during and following World War II.

Protective Sealing for Components Developed by FT&R

An entirely new approach to commercial and military equipment design — particularly for special applications—has been opened to industry through the successful encapsulation of selenium rectifier stacks and allied components.

The unique development in component-sealing is the result of research at Federal Telephone and Radio Corporation, Clifton, N. J., an associate of the IT&T.

With Federal's new method of protective sealing, it is now possible to assemble transformers, capacitors, resistors, and components — interconnected — into equipment as single blocks. As a result, entire assemblies as well as individual units can be replaced as easily as plugging in a vacuum tube. This avoids the necessity of time-consuming repairs, an important consideration in the replacement of expendable military equipment.

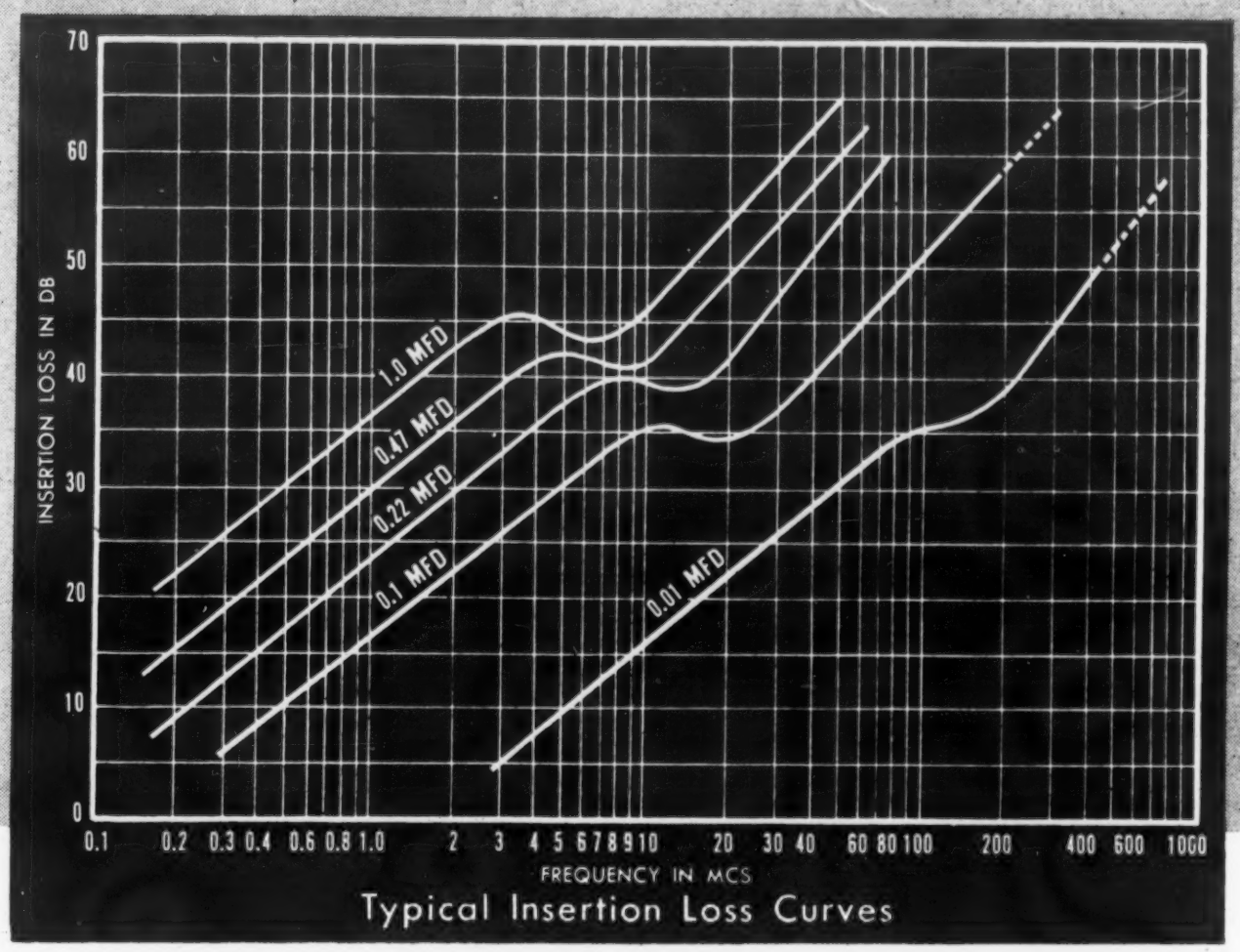
THIS DEPARTMENT'S PRINCIPAL SOURCE

Telecommunications Reports
Roland C. Davies, Editor
National Press Building
Washington, D. C.

THE MOST EFFECTIVE CAPACITORS FOR R-F NOISE SUPPRESSION...

...are the

NEW SPRAGUE THRU-PASS® CAPACITORS



Typical Insertion Loss Curves

THRU-PASS CAPACITORS are a new Sprague development for use in radio interference reduction in communication and radar equipment.

• Thru-Pass Capacitors not only reduce to a negligible value the effect of external connection inductance to a capacitor but they also have a minimum length of internal path for radio interference currents. *Their performance is closer to that of a theoretically ideal capacitor than that of any other paper capacitor!*

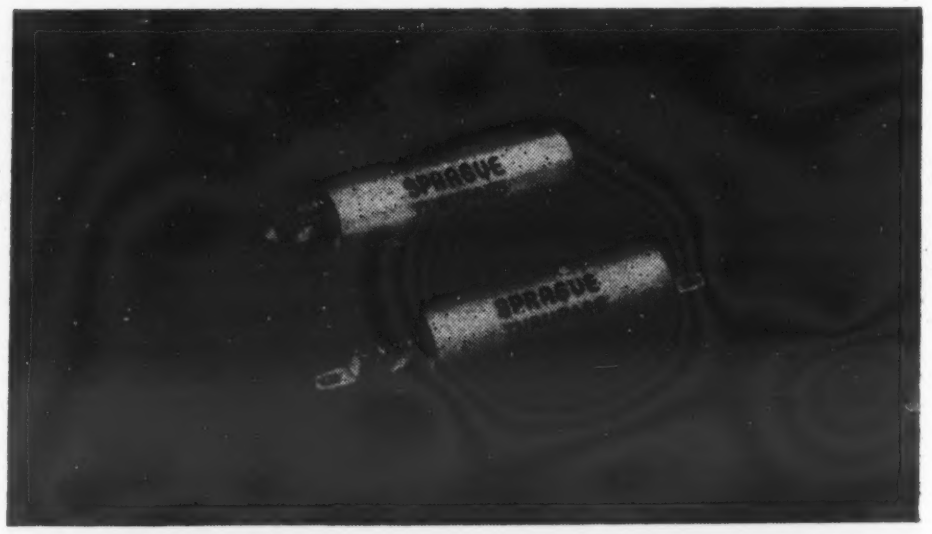
• Electrically, Thru-Pass Capacitors are three-terminal feed-thru devices which are connected in a circuit in a manner similar to a low pass filter; the tab or lead terminals are connected in series with the circuit being filtered while the case is grounded.

• The threaded-neck mounting on Type 102P and 103P Subminiature Thru-Pass Capacitors is designed to give a firm metallic contact with the mounting surface over a closed path encircling the feed-thru conductor and to eliminate unwanted contact resistance so that the theoretical effectiveness of these new units is realized in practice. The milled flats on the threads help ensure vibration-proof mounting since the capacitors cannot rotate if mounted in a flatted opening instead of the usual circular hole.

• Type 102P and 103P Capacitors are all hermetically encased. Glass-to-metal solder-seal terminals are employed in order to assure positive protection against severe atmospheric conditions.

• Both types are impregnated with Vitamin Q, Sprague's exclusive inert synthetic impregnant, in order to provide maximum insulation resistance and minimum capacitance change with temperature. Type 102P units are processed for −55°C to +85°C operation while Type 103P units have their top operating temperature extended to +125°C.

• Engineering Bulletin 215 gives full details and standard ratings. Write on your business letterhead for your copy to Sprague Electric Co., 287 Marshall St., North Adams, Massachusetts.



TYPES 102P AND 103P 5 AMPERE THRU-PASS CAPACITORS
SHOWING CHOICE OF LEAD OR TAB TERMINALS

SPRAGUE

WORLD'S LARGEST CAPACITOR MANUFACTURER

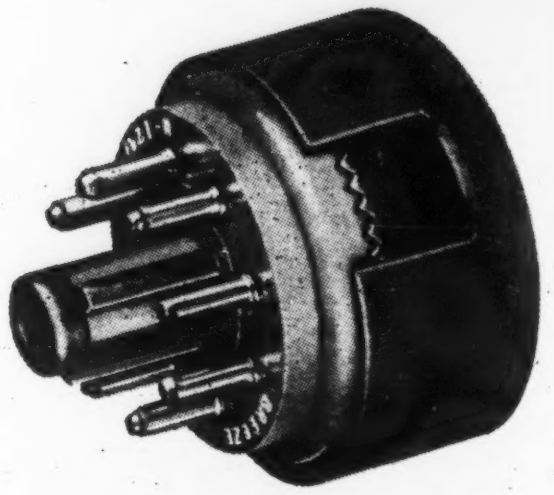
EXPORT DIVISION: CABLE SPREXDIV, NORTH ADAMS, MASS.

"THRU-PASS" AND VITAMIN "Q" ARE SPRAGUE TRADEMARKS.

RUGGED as a RHINO ... Quick as a Fox!

Two Special Purpose Connectors by

BREEZE MARK

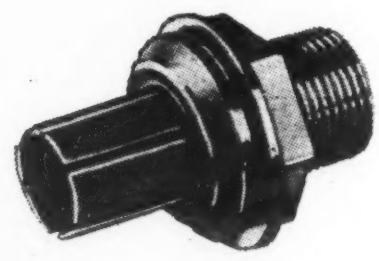


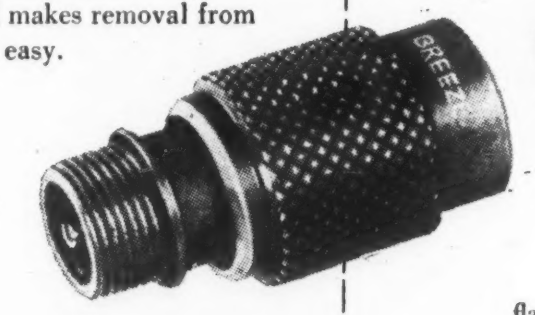
Battery Connectors

8-pin type for both A and B batteries used in all types of field communication equipment. "RUGGEDIZED" for extra security and long service life: polarizing stud is ALL METAL and all metal parts are cadmium plated and sealed with an iridite sealer. Cable may be brought out at any desired side position and locked. Handy bail makes removal from inaccessible places easy.

Quick Disconnect

Simply push male and female members together and lock. To disconnect with minimum resistance, pull back sleeve on plug shell and disconnect. Exceptionally low disengaging force required (less than 6 lbs., excepting pin friction). Vibration proof, moisture-proofed with synthetic rubber insert. Meets AN pin pattern and voltage requirements, in accordance with MIL C-5015. Plug shell and coupling sleeve are aluminum alloy, cadmium plated and iridite-sealed. (Federal Spec. QQP – 416, Type 2.)





Receptacle Types: Round flange single hole panel-mounted, square flange for 4 bolts, or specially flanged to specification. All contacts silver plated.

We invite your inquiries on any problems concerning connectors. Our wealth of engineering experience in this specialty is at your service.

BREEZE CORPORATIONS, INC.

41 South Sixth Street, Newark, N. J.

'Audrey'—New Electronic Device Developed by Bell Labs

Development of an electronic telephone device which can understand and intelligently react to spoken numbers was announced Jan. 5, by Bell Telephone Laboratories, which said the special circuit—named "Audrey" as a contraction of "automatic digit recognizer" — automatically determines which of 10 numbers from one through zero has been spoken into an ordinary telephone.

In its present form, "Audrey" responds by flashing an appropriate light, but it could equally well control other operations, such as dialing mechanisms, according to the Laboratories, which added that it is hoped eventually to add other sounds to the device's vocabulary.

The nerve system of the device involves much of the same sort of equipment used in a telephone central office, particularly relays, which are the heart of the modern dial system. To simplify a very complex electronic process, the newly-constructed recognizer operates on a principle of memory and matching. In other words, it listens to the human voice, then sorts the speech sounds into electrical categories which conform in their own medium to sound wave patterns.

Lt. Col. Robert C. Green Returns to CAA

Major General Raymond C. Maude, Director of Air Force Communications-Electronics, at Headquarters U. S. Air Force, paid a farewell tribute to "one of his ablest" C-E staff officers, as Lt. Colonel Robert C. Green, Plans and Policies officer, returned to an executive post with the Civil Aeronautics Administration.

Col. Green will resume his former duties as Chief of the Airways and Airport Division, International Region of the CAA. This latest tour of active duty brings Col. Green's total active commissioned service with the Air Force over the twenty-year mark.

Col. Green and Gen. Maude.

Marjorie Geoghegan

SIGNAL Managing Editor Resigns

With this issue, Marjorie Geoghegan, managing editor of SIGNAL, leaves AFCA and Washington. Marjorie was married on January 17th to Mr. James M. Ledwith and they are now living in Chicago.

Marjorie has been on the staff of SIGNAL for three years, specializing in make-up, layout and art work. When she first came to AFCA, she was editorial assistant to Wallace Fingal, then editor of SIGNAL, and has been managing editor under George P. Dixon, now editor of the magazine.

All of us at AFCA headquarters will miss Marjorie's cheerful disposition and ready laugh and we extend to her our congratulations and appreciation for the fine work she has done in improving the looks and content of SIGNAL. Good luck to the Ledwiths!

Westinghouse Tour for Dealers and Distributors

Hundreds of Westinghouse television-radio dealers from all over America will visit Paris, Nice, Cannes, the Riviera, and Rome next spring as guests of Westinghouse. The air voyage called the Westinghouse "European Holiday" was announced recently by Mr. T. J. Newcomb, recently-appointed manager of the Westinghouse Electric Corporation's Television-Radio Division.

Dealers will be transported to the Continent in luxurious stratocruiser planes and will take planned tours of internationally famous pleasure spots on the Continent during the two-week, all-expense-paid "European Holiday."

AMERICAN CHEMICAL PAINT COMPANY

AMBLER CHEMICALS ACP PROCESSES PENNA.

Technical Service Data Sheet

Subject: INDEX OF ACP CHEMICALS FOR METAL PRESERVATION AND PAINT PROTECTION

METAL	OPERATION	ACP CHEMICAL
ALUMINUM	*Cleaning*	"DEOXIDINE" "DURIDINE" "ACP RIDOLINES AND RIDOSOLS"
	Preparation for Painting	"ALODINE" "DURIDINE" "DEOXIDINE"
	Protection from Corrosion	"ALODINE"
BRASS	*Brightening*	"ACP BRIGHT DIP"
	Cleaning	"DEOXIDINE" "DURIDINE" "ACP RIDOLINES AND RIDOSOLS"
	Cleaning for Painting	"DEOXIDINE" "CUPROTEK
	Corrosion Prevention	"CUPROTEK"
	Soldering Flux	"FLOSOL"
COPPER, BERYLLIUM, AND COPPER ALLOYS	*Brightening*	"ACP BRIGHT DIP"
	Cleaning	"DEOXIDINE" "DURIDINE" "ACP RIDOLINES AND RIDOSOLS"
	Cleaning for Painting	"DEOXIDINE" "CUPROTEK"
	Coating Steel with Copper	"CUPRODINE"
	Corrosion Prevention	"CUPROTEK"
	Scale Modification	"RIDOXINE"
	Soldering Flux	"FLOSOL"
	Stripping Copper Coatings	"ACP COPPER STRIPPING SOLUTION"
GALVANIZED IRON, ZINC, AND CADMIUM	*Cleaning*	"DURIDINE" "ACP RIDOLINES AND RIDOSOLS"
	Corrosion Proofing	"ZINODINE"
	Paint Bonding	"ZINODINE"
	Phosphate Coating, in Preparation for Painting	"LITHOFORM"
	Soldering Flux	"FLOSOL"
IRON AND STEEL	*Chromate Coating, in Preparation for Painting*	"CROMODINE"
	Cleaning	"ACP RIDOLINES AND RIDOSOLS"
	Cleaning for Painting	"DEOXIDINE" "DURIDINE"
	Coating with Copper	"CUPRODINE"
	Drawing and Extrusion	"GRANODRAW"
	Paint Bonding	"CROMODINE" "DURIDINE" "GRANODINE" "PERMADINE" "THERMOIL-GRANODINE"
	Paint Stripping	"CAUSTIC SODA AND SOLVENT NO. 3"
	Phosphate Coating, in Preparation for Painting	"DURIDINE" "GRANODINE" "PERMADINE" "THERMOIL-GRANODINE"
	Phosphate Coating, to Protect Friction Surfaces	"THERMOIL-GRANODINE"
	Pickling with Inhibited Acids	"RODINE"
	Rust Prevention for Unpainted Iron	"PEROLINE"
	Rust Proofing	"PERMADINE" "THERMOIL-GRANODINE"
	Rust Removal—Brush, Dip, or Spray	"DEOXIDINE"
	Soldering Flux	"FLOSOL"
MAGNESIUM	*Cleaning*	"DURIDINE" "ACP RIDOLINES AND RIDOSOLS"
	Pickling	"RODINE (M-200)"
STAINLESS STEEL	*Cleaning*	"DEOXIDINE"
	Coating with Copper	"CUPRODINE"
	Pickle Polishing	"RODINE"
	Soldering Flux	"FLOSOL"

CHEMICALS ACP PROCESSES

WRITE FOR DESCRIPTIVE FOLDERS ON THE ABOVE CHEMICALS AND FOR INFORMATION ON YOUR OWN METAL PROTECTION PROBLEMS

CHEMICALS ACP PROCESSES

Radio Military Amateurs

MARS Anniversary

Typical of the area "Open House" demonstrations arranged to observe the Fourth Anniversary of the Military Affiliate Radio System 26 November 1952 was the one held at Third Army Headquarters, Fort McPherson, Georgia.

Captain Warren H. Robson, command director, invited the public to inspect the facilities at station A4USA and to witness transmission of a greeting from Lieutenant General A. R. Bolling, Commanding General, Third Army.

The text of General Bolling's message follows:

On this CMA the fourth anniversary of MARS CMA it is a pleasure to send greetings to the combined network of military stations and licensed amateur radio operators within Third Army Area PD traditionally CMA the radio amateur has considered his hobby one in which he could be of service to his community PD never has this spirit of service been of more importance to the welfare of the community in particular and the nation as a whole as it is at this critical time PD as you hear and copy these words CMA I want you to know that your active participation in the military affiliate radio system is appreciated by all of us who are concerned with the defense of our country PD signed A PD R PD Bolling CMA Lieutenant General CMA Commanding General CMA Third Army PD

A message transmitted from MARS Headquarters stations WAR and AIR at the Pentagon brought greetings from Secretary of Defense Robert A. Lovett:

On behalf of the Department of Defense it is my pleasure to extend congratulations and best wishes to the military affiliate radio system on the occasion of its fourth birthday PD As a result of your splendid program you encourage private citizens to become interested in military communications methods and practices PD Furthermore CMA and as a result of your unstinting efforts you assist in the organization and operation of radio nets for morale and training purposes and for possible use by military commanders or local civil authorities in the event of disaster or emergency and also during any situation which causes existing official and commercial communication channels to become overloaded or inoperative PD The members of MARS are to be commended for their excellent record of public service and I extend them every good wish in their further endeavors PD

Lt. Gen. A. R. Bolling, Commanding General, Third Army, inspects Third Army MARS Headquarters station A4USA. L-R: Sgt. George Campbell and Sergeant First Class Gordon Yarte, station operators; Colonel S. P. Collins, Third Army Signal Officer; Captain W. H. Robson, Third Army MARS Director, and General Bolling.

This composite was sent as an acknowledgment to all who participated in the special MARS program celebrating the Fourth Anniversary of the group.

New Radio Calls for Security Force

With the implementation of the Japanese peace treaty, amateur radio calls assigned to Security Force personnel are now prefixed KA instead of JA. The new licenses are termed "Auxiliary Military Radio Operator's Authorization" rather than "amateur radio license."

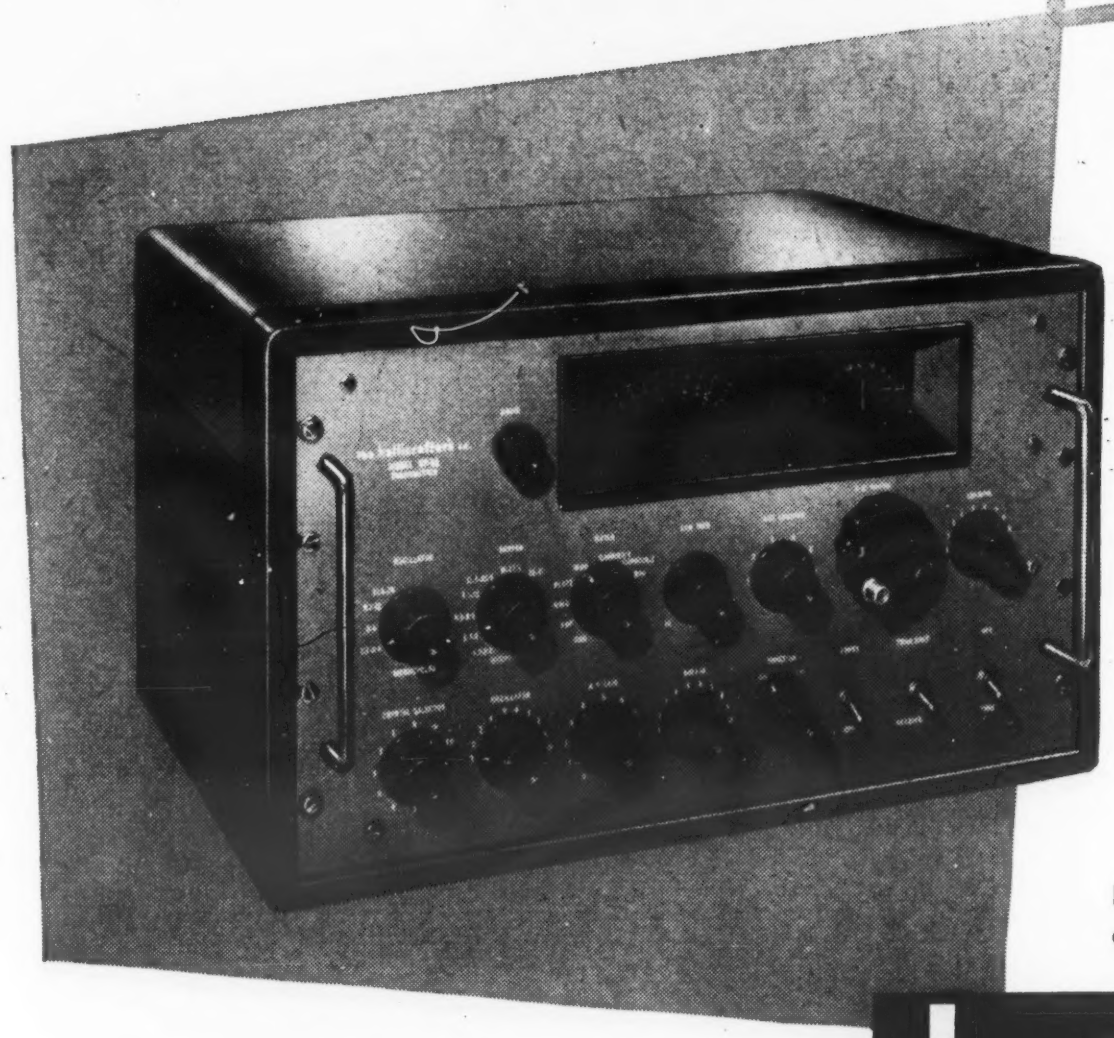
Finally! No More TV Interference Problems!

The New Hallicrafters HT-20 is T.V.I. proofed!*

Here's the news you've been waiting for—a medium power transmitter (100 watts) that solves the problem of television interference once and for all. The Hallicrafters HT-20 is the answer. Completely tested in the lab and in the field, here is a transmitter that is truly T.V.I. Proofed*.

This is not simply a revamped design, but completely new circuitry to meet this problem. Physically, too, the entire transmitter is new from the massive, two-piece, completely rigid chassis to the electrical air cooling system of the final amplifier tube.

See this newest Hallicrafters—get the complete story of the finest transmitter, dollar for dollar, on the market today. Or write Hallicrafters direct for full details.



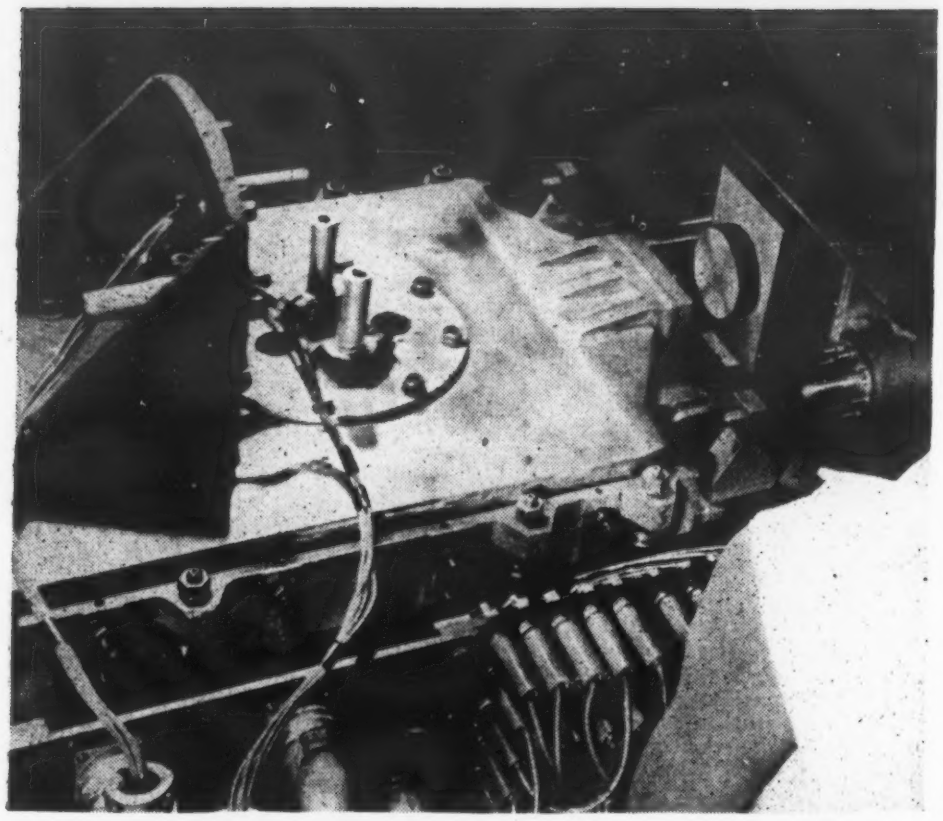
Check these features!

- 100 watts carrier power with high level (Class AB2) modulation on any band.
- Continuous coverage, with overlapping bands, from 1.7 to 30 mc.
- Compact, efficient design. Amazing for its power. The HT-20 is 20½" long, 11¾" high and 16¾" deep.
- Weight of transmitter, in cabinet, 105 pounds.
- All transformers and chokes operate "cool"—maximum temperature rise of 40 degrees. This means fewer replacements, long operating life.
- Operates equally well from relay rack or in cabinet on table top.
- Uses 117 volts, 60 cycle AC.
- Moderate cost.

* **T.V.I. PROOFED**—means that this transmitter has circuitry specifically designed to eliminate spurious and harmonic energies that result in television interference.

World's Leading
Manufacturer of Precision Radio, Television
CHICAGO 24, ILL.

hallicrafters



Wham-O

Four TUNG-SOL ELECTRON TUBES receive a terrific jolt as a heavy steel battering ram smashes against the movable table on which they are mounted. Each tube is in a different position to determine stability in all directions. With an acceleration up to one thousand times the pull of gravity, this machine can give tubes a wicked beating.

Vigorous Quality Control procedures such as this give Tung-Sol Tubes the exceptionally high degree of uniformity preferred by the armed services. Quality Control is a whole series of exacting tests and inspections which point the way to better, more dependable tubes—sturdier both mechanically and electrically.

Tung-Sol Tubes for radio, TV and special industrial applications means top performance, longer and more efficient service life, plus lowest maintenance. You'll find complete satisfaction with Tung-Sol Tubes and Tung-Sol Service.

Write for sales or engineering information.

TUNG-SOL ELECTRIC INC., Newark 4, N. J.

Sales Offices: Atlanta • Chicago • Culver City
Dallas • Denver • Detroit • Newark

TUNG-SOL®
ELECTRON TUBES
for Reliable Service

TUNG-SOL MAKES All-Glass Sealed Beam Lamps, Miniature-Lamps, Signal Flashers, Picture Tubes, Radio, TV and Special Purpose Electron Tubes.

MARS

Application for MARS Membership

Army and Air Force

Recently requests have come to the SIGNAL office for membership in MARS. For the information of the readers, we do not handle MARS membership, but those interested in joining either Army or Air Force MARS should follow the following procedure.

Army MARS: Apply to the MARS Director of the Army Command in the United States under whose jurisdiction the applicant is stationed or resides, or apply to:

Chief, Army MARS
Office of the Chief Signal Officer
The Pentagon
Washington 25, D. C.

Air Force MARS: Apply to the MARS Director of the numbered Air Force in which the applicant is stationed or resides, or apply to:

Chief, Air Force MARS
Department of the Air Force
Directorate of Communications
The Pentagon
Washington 25, D. C.

Membership in both Army and Air Force MARS is voluntary and is open to all military personnel, including ROTC, National Guard, Active and Reserve personnel, and civilians over 21, who hold a valid FCC amateur license.

Air Force Communications Executives

(Continued from page 19)

cations-electronics matters. In conferences, he discusses some of the most important personnel, operational and organizational problems facing the Armed Forces and civilian industry today.

In the final analysis, it can be stated that the Communications-Electronics Staff Officer Course is guided by the Air University principle that "the command exists solely for the purpose of carrying out an assigned mission; that all activities within the command and all individuals assigned to the command must contribute to its accomplishment; any action which does not contribute is wasted effort." The Course recognizes that communications-electronics can be either a supporting activity of the command in accomplishing a command mission or that communications-electronics may be the primary mission of the command itself. It realizes, too, that effective command and/or staff work in support of a mission—without wasted effort—is a creative art; that effectiveness cannot be taught, but, like any other creative art, its mastery depends upon knowledge, and upon skills and techniques that can be taught. The Communications-Electronics Staff Officer Course, strives to impart that knowledge and to teach those skills and techniques to the senior Communications-Electronics Staff Officers of the USAF.

****

Post Script—Reports from over the world attest to the gratifying work being done by "Communications executives" who have been graduated from the CE-SOC. To the communications-electronics officer who has not yet attended the School I can say without reservation that you have a stimulating and valuable experience awaiting you. To the reader who will not have the opportunity to attend the course I can say sincerely that inquiries about the course—or contributions to it—will be welcomed at any time, either in person or via the U. S. Mail.

THE PRODUCTION UNIT IS LIKE THE SAMPLE . . . AND EACH PRODUCTION UNIT IS LIKE THE OTHER . . . *ELECTRICALLY AND MECHANICALLY!*

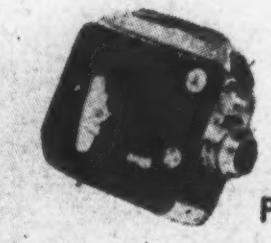
STACKPOLE *Ceramag*

FERRITE CORES

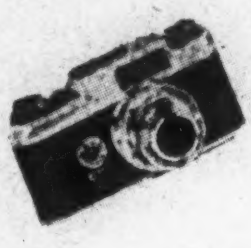
Electronic Components Division, STACKPOLE CARBON COMPANY, *St. Marys, Pa.*

PHOTOGRAPHY

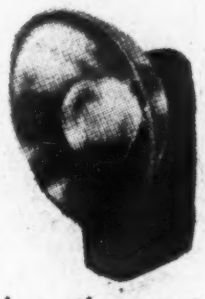
SIGNAL's FIRST PHOTOGRAPHIC ISSUE



The May-June 1953 issue of SIGNAL Magazine will be devoted to Photography and the Photographic Industry. Spotlighted in the enlarged feature section will be: Personalities in the photographic world . . . Hints for improved amateur picture taking . . . Stories of companies which have pioneered in the industry . . . Advancement of commercial photography . . . War and peace photography in the Services . . . New and interesting books.



In this all-photographic section, space will be reserved for a number of "Company Articles". These stories (on a first-come-first-served basis) will tell the history of your company and its products. Articles for our "Who's Who" will be welcomed. Your candidates for this department may include inventors, scientists, photographers, company officials or anyone distinguished in the field. News of happenings in the photographic industry—new equipment on the market—helpful suggestions for the amateur photographer—all will be used to the best advantage of our readers and you.



Above all, keep your name before the members of AFCA, and the estimated thirty thousand readers of SIGNAL including key people in Industry and the Services. Place your advertising in SIGNAL and take advantage of publicizing your products before this vital group. Rates for advertising are listed on the next page. Deadline for advertising copy for the Photographic Issue is April 15, 1953.

Get in Focus ! !

Be Represented in* SIGNAL's *FIRST

PHOTOGRAPHIC ISSUE

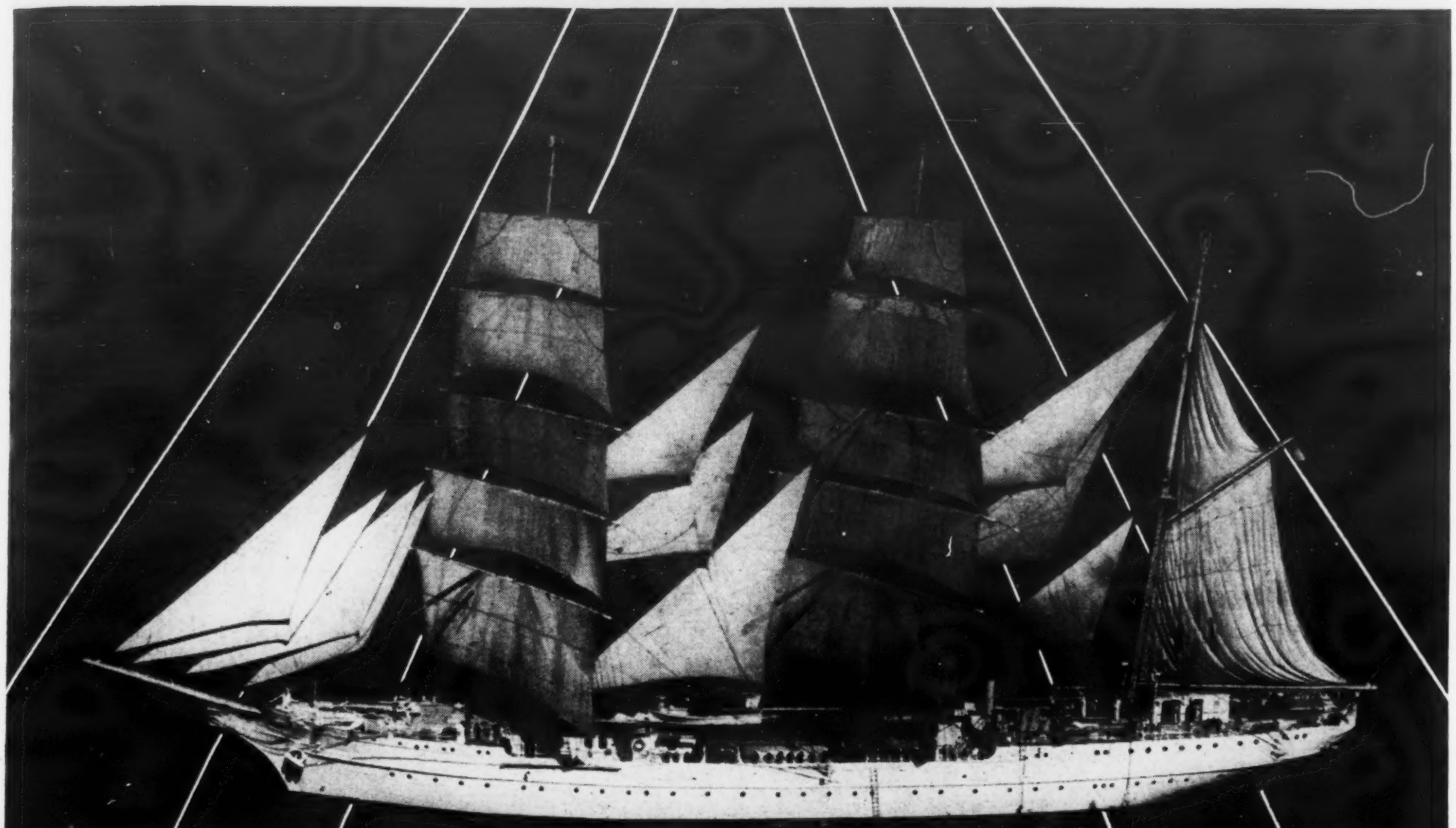
The above material is a reproduction of the center spread of a brochure recently sent to all photographic companies and those who would be interested in SIGNAL's first all photographic issue. Below are listed AFCA's group members in the photographic industry as they appeared on the 4th page of the brochure.

AFCA Group Members in the Photographic Industry

Argus Cameras, Inc.
DeVry Corporation
Eastman Kodak Company
Federal Mfgr. & Eng. Co.
General Aniline & Film Corp.
General Electric Company
Graflex, Inc.
Haloid Company
Hycon Manufacturing Company
Ilex Optical Company
Society of Motion Picture Engineers
Remington Rand, Inc.
Simmon Brothers, Inc.
Technicolor Motion Picture Corp.
Wollensak Optical Company
Photographic Society of America

These companies and organizations in the photographic world as members of the AFCA take an active part in carrying out the objectives of the Association. Other companies are extended a sincere invitation to join at this time. For further information, contact the Executive Secretary, George P. Dixon.

FACSIMILE



The Eagle

A windjammer, lazy in a summer breeze—a flat top, knifing through a sullen sea . . . have this in common . . . Times Facsimile equipment . . . for the speedy reception of weather charts and other important information. ★ ★ ★ ★ ★ ★ ★ The ship illustrated is "The Eagle", a full rigged 295 ft Coast Guard training bark based at the U. S. Coast Guard Academy in New London, Connecticut.

TIMES FACSIMILE

CORPORATION

540 W. 58th Street, New York 19, N. Y. · 1523 L Street, N.W., Washington 5, D. C.

DESIGNERS AND MANUFACTURERS OF FACSIMILE COMMUNICATIONS EQUIPMENT FOR OVER 15 YEARS

Stabilization Processing With Sea-Water Solutions

The use of sea water in the stabilization processing of film and paper was explained and demonstrated by Mr. W. C. Burner and Mr. S. Levinos at the first 1952-1953 technical meeting of the Monmouth Chapter, Society of Photographic Engineers held recently at Fort Monmouth. Mr. Levinos traced the developing of stabilization processing, in which the washing step is eliminated with a great saving of time and water. After explaining that a further saving of fresh water might be profitable in ship-board applications and in areas where only salt water is available, it was shown that the necessary solutions may be made with normal sea water without any treatment whatsoever. Pictures of the audience were exposed and processed with the sea-water solutions during the meeting and prints were made with a water resistant paper.

Briefly, the process is a new rapid method for the processing of photographic film and prints perfected by personnel of the Signal Corps Engineering Laboratories, Fort Monmouth, New Jersey. The key step in the process involves conversion of the unexposed silver halide to a light transparent, light insensitive form, thereby eliminating the necessity for washing. Processing time for films is about one-tenth that of conventional processes; waterproof photographic paper, a requisite of this new technique, is processed in about one-half the normal time. Films or prints are developed in a specially formulated amidol developer, transferred to a stop bath, and then stabilized by immersion in a solution of thiourea, the stabilizing agent. Permanence of the processed materials, although not of archival quality, is considered very good.

Infrared and Ultraviolet Photography

A Kodak data book: "Infrared and Ultraviolet Photography," has been published by the Eastman Kodak Co. As indicated in the title, this handy and convenient little booklet covers infrared and ultraviolet photography in most of its phases.

As is well known, infrared photography extends the vision of the camera beyond the limits of the human eye, affording a new photographic and pictorial dimension, as well as a medium for making record and technical photographs not otherwise possible. Infrared photography penetrates haze and renders the sky, green foliage, fabrics, etc. in a manner entirely different from ordinary photography.

On the other hand, ultraviolet photography serves in examining subjects not responsive to ordinary photographic methods. Investigation of questioned, altered and faded documents, restoration in works of art, the detection of invisible inks and fingerprints on a multi-colored surface are frequently possible by ultraviolet.

The booklet contains information compiled to assist photographers with or without experience in these fields. Technical applications are described in some detail. Pages 3-27 give extensive data on infrared procedure; ultraviolet techniques are described on pages 28-37. A brief bibliography is listed on pages 38-40.

$10,000 Graflex Photo Contest

To Award 48 Cash Prizes

The 1953 Graflex contest, for which the prize money has been doubled over previous years, will run until February 15, 1953. It features, also, the addition of a new Picture-Story division which will offer a total of $3,150 for eight winning stories. First prize in this division will be $1,000.

Another new Press division, open only to professional news photographers, has also been added to the contest. In all, 48 cash prizes will be awarded, and to break down competition fairly, separate classes have been set up in the black and white division for teen-agers, non-professionals, and professionals. Eight prizes will be given in each class, thus eliminating competition between amateurs and professionals. The Color division and the Picture-Story division will be open to all three classes. Pictures in each division will be judged by a separate panel of judges.

The contest is open to all pictures made with any model Ciro-flex or Ciro 35, as well as to pictures made with Graphic and Graflex cameras, including the new Graflex 22. There is no limit on subject matter, and all pictures made anywhere in the world since December 1, 1951 will be eligible.

Seventh Annual Photo Show, New York City, Feb. 12-16, 1953

The Seventh Annual Photo Show will be held in Grand Central Palace, New York City, February 12 to 16, 1953.

The show, which in former years was held in the 71st Regiment Armory, 34th Street and Park Avenue, New York City, will have 26,000 square feet more of space in its new location than was available in the Armory according to Wilfrid L. Knighton, Managing Director of the show. About 150 domestic and foreign manufacturers of photographic equipment and accessories will exhibit their products on two floors and a stage will be provided for entertainment programs.

New Swiss Wide-Angle Lens For Aerial Work

A new wide-angle lens for aerial cameras that gives much clearer, sharper pictures from thousands of feet up was described to the International Society of Photogrammetry meeting which recently closed in Washington, D. C. An outstanding feature of the new lens is that even the extreme corners of pictures get the light necessary for good definition. In other wide-angle types, so far constructed, the light fades off towards the corners. The lens contains ten separate pieces of ground glass, some curved inward and some outward. The lens was developed by Dr. Ludwig Bertele of the Henry Wild Co., Herrbrugg, Switzerland.

Annual Photogrammetry Meeting

Over 1000 experts in the field of photogrammetry met in Washington January 14-16 at the 19th Annual Meeting of the American Society of Photogrammetry.

Photogrammetry is the science of obtaining measurements from photography. Normally, the science is associated closely with cartography, since map-making from aerial photography is the largest user of photogrammetric techniques.

The applications of photogrammetry include many major fields, from medicine to atomic warfare.

It is a recognized fact that during the last war that over 90% of intelligence information gained by our armed forces was from photography and its analysis by photogrammetric techniques.

in this room . . .

there's no room for doubt

There can be no room for doubt in the continuity and fidelity of your broadcast. Precisely the reason you demand — and get — the best in transmitting and studio equipment.

Nor should you compromise with quality in the tape recorder you select.

In **AMPEX** Recorders you will find the same matchless reliability and performance you expect of your transmission equipment . . . and for the same reason — they are engineered to the highest *professional* standards.

AMPEX
brings you these cost-saving operating advantages:

- **UNINTERRUPTED SERVICE**
  Under the demand of heavy-duty programming, AMPEX Recorders deliver thousands of hours of unbroken service. Recently a set of AMPEX heads was returned from Honolulu for routine replacement after 11,000 hours continuous use, 17 hours a day. The heads were still within AMPEX specifications for new heads and had several thousand more hours of use remaining.
- **MINIMUM "DOWN TIME"**
  AMPEX Recorders are designed for thousands of hours of continuous operation with minimum "down time," resulting in low maintenance costs and protection from sudden broadcast failures.
- **ACCURATE TIMING**
  AMPEX split-second timing accuracy protects your programs and commercials from embarrassing time overlaps.
- **HIGHEST FIDELITY**
  Even when programs are repeatedly transcribed from one tape to another, there is no noticeable build-up of noise level, "wow" or distortion.
- **LONG LIFE**
  AMPEX Recorders are designed and built for years of service dependability. Its recordings match established NARTB standards. When you have an AMPEX, you have a machine built for years-ahead performance.

IF YOU PLAN FOR TOMORROW, BUY AN AMPEX TODAY

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AMPEX ELECTRIC COMPANY
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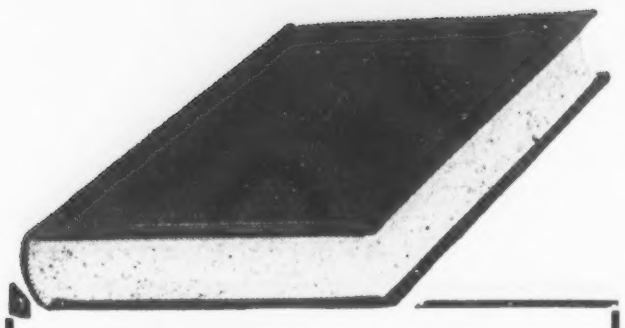


Presenting

A *thorough* and

***accurate* treatment of**

BASIC RADAR CIRCUITS

With this single reference manual you can quickly give yourself a background in the fundamentals of radar. The book covers the subject for all engineers and physicists who are concerned with electronic applications. Reflecting the broad experience of M.I.T. radar specialists, it deals with pulse circuits and high-frequency devices common to nearly all radar equipment. The lucid explanations of circuit operation are based on physical concepts and make free use of numerical examples.

PRINCIPLES OF RADAR

By Members of the Staff of the Radar School, Massachusetts Institute of Technology

Third Edition

by J. FRANCIS REINTJES
Assistant Professor of Communications

and GODFREY T. COATE
formerly Assistant Professor of Electrical Engineering, Massachusetts Institute of Technology

1065 pages, 6 x 9, 642 illustrations, $7.75

This book was prepared originally to give a sound, rapid grounding in radar principles and their wartime applications. In the present edition the reader will find this sound radar material brought abreast of practice and presented more clearly, through complete reorganization and rewriting of nearly all the book.

Check this book for accurate data on:

- Discernment of Signals and Noise
- Types of Radar Equipment
- Step Generator
- Tube and Wiring Capacitances
- Applications of Artificial Trans-Sine-wave Components of Video Pulses
- Characteristics of Noise
- Noise Figure
- Input Admittance
- Power and Power Capacity
- Electronic Tuning, Hysteresis, and Load Effects
- Risks Diagrams
- Choke Joints
- Attenuators
- And many others

Book Dept, SIGNAL
Armed Forces Communications Association
1624 EYE STREET, N.W.
WASHINGTON 6, D. C.

ESSENTIALS OF MICROWAVES. By Robert B. Muchmore. John Wiley & Sons, Inc., 236 pages, $4.50

A book with one purpose—to present facts that will enable the reader to understand microwave apparatus and its functions.

Mr. Muchmore begins his book with the laws of electricity and magnetism as they have been discovered since the early eighteen-hundreds. Using these basic laws as guides, he then discusses modern developments in microwave apparatus. His clear and logical presentation of written material is further clarified by two hundred and two apt illustrations.

In order to enable the novice to easily grasp the basic physical principles that underlie the operation of all microwave devices the author stresses the physical pictures and presents concepts in words rather than in mathematics, but for the practicing engineer or technician the author also presents the mathematical formulas.

The final chapter on measurements is perhaps a fitting close, because all the previously described phenomena and apparatus are interpreted, described, and judged on the basis of the measurements that can be made.

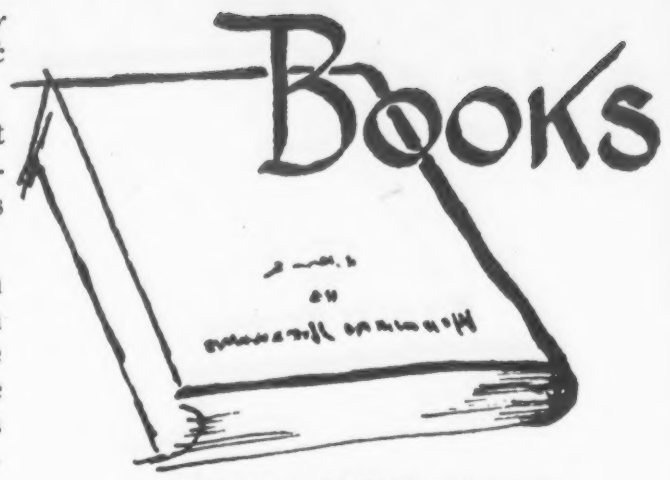
ESSENTIALS OF MICROWAVE is an excellent survey for anyone who wants to obtain or improve his appreciation of this particular field of activity.

THE NEW DICTIONARY OF AMERICAN HISTORY. By Michael Martin and Leonard Geiber. Philosophical Library, 695 pages. $10.00

A ready reference source nowhere else available in the literature of American history. It is unique in the field, in having successfully consolidated in one volume more than 4,000 articles, alphabetically arranged, which cover the materials of American history.

In keeping with contemporary demands the authors have encompassed the entire scope of American history from early colonial period to mid-1952. While not eschewing the conventional political and military events, they have been careful to cover the significant developments in economies, finance and banking, labor relations, constitutional and administrative law, social security, literature, science, commerce, international relations, foreign policy, education, and the arts.

This comprehensive and scholarly work will enable the teacher, scholar, student and layman to pinpoint quickly the object of search, whether it be a name, place, event, catch-phrase, or any other item in the field.



FRANK MARTINS, Manager

THREE BATTLES: Arnaville, Altuzzo, and Schmidt. By Charles B. MacDonald and Sidney T. Mathews. Office of the Chief of Military History, Department of the Army, 443 pages. $4.00.

Devoted to the exploits of small units in battle, this latest volume in the series *U. S. in World War II* is the first that focuses exclusively on the battalions, the platoons, and individual soldiers that fought in the lines.

"River Crossing at Arnaville" and "Objective: Schmidt," both by Mr. MacDonald, are the stories, respectively, of a battle that started badly and ended in victory, and one that began with an unexpectedly easy success and turned into tragic defeat.

"Break-Through at Monte Altuzzo," by Mathews, is the account of how, after a succession of misguided efforts, a comparative handful of men from the mighty Fifth Army penetrated the formidable Gothic Line defenses in Italy.

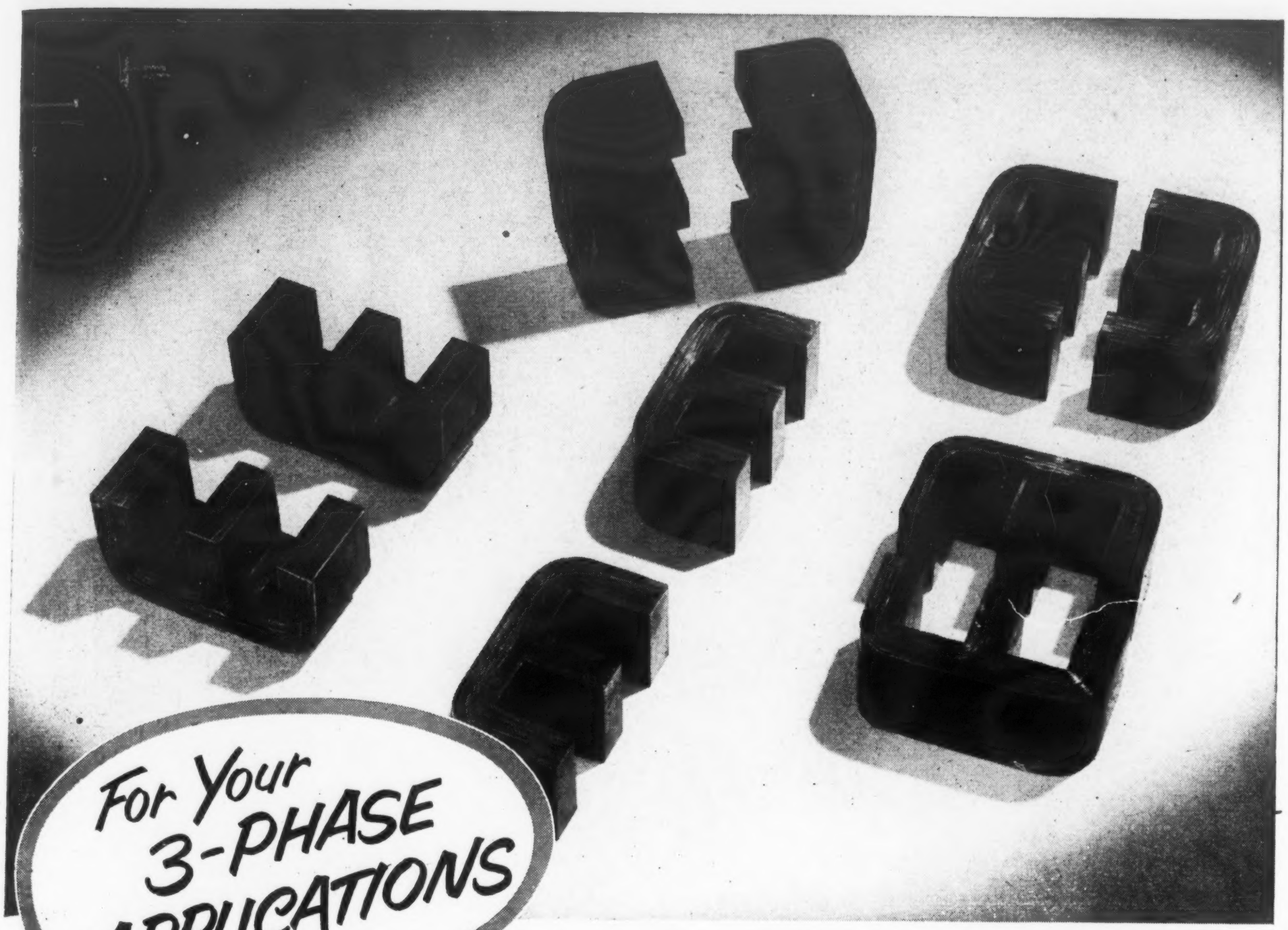
This is the fourteenth volume to be published in the World War II series now being prepared by the Office of the Chief of Military History, Department of the Army.

RADIO SPECTRUM CONSERVATION. A report of the Joint Technical Advisory Committee IRE-RTMA. McGraw-Hill Company, Inc., 221 pages. $5 00

Here is a realistic review of the properties of radio transmission and discussion of the course to be pursued to assure maximum benefits in its use. Clearly and factually the volume presents the point of view that the radio spectrum is a public resource requiring the same wise conservation practiced with forests, farmlands, and mineral wealth.

Divided into six parts, it begins with a historical survey reviewing the development and increasing use of the radio spectrum. The other parts summarize the present state of knowledge of the various regions of the spectrum, present an ideal allocation table, offer specific suggestions to bring the actual allocation in line with the ideal, and give an extensive bibliography of the material in the field.

THE FORGOTTEN REPUBLICS. By Clarence A. Manning. Philosophical Library. 264 pages, $2.75. . . . Three Baltic Republics—Estonia, Latvia, and Lithuania—the countries whose fate in the last decade has been passed over in silence raise the question of the rights of small peoples whose ideals are the ideals o civilization and whose future is the future of humanity.



For Your 3-PHASE APPLICATIONS

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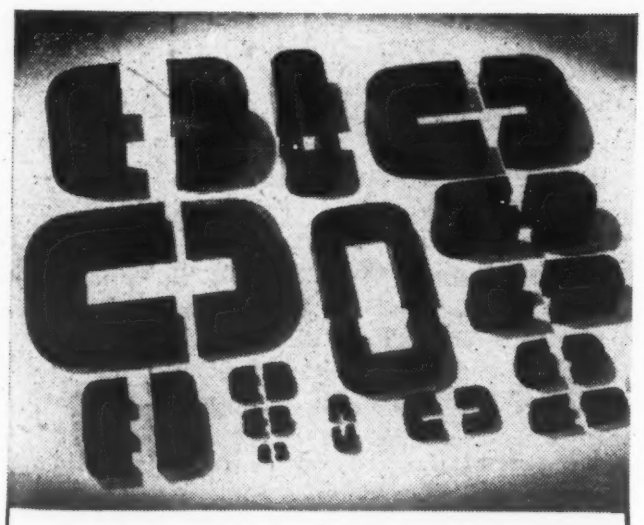

C-Cores to meet any requirement

For your single-phase applications, Arnold "C"-Cores are available in any shape and quantity, and in any size from fractions of an ounce to hundreds of pounds . . . wound from Silectron strip in a wide range of ultra-thin and heavier gauges. (Sizes up to 10 lbs. in 12-mil strip; to any weight in thinner gauges.)

made from SILECTRON strip

(grain-oriented silicon steel)

The use of "E" cores, wound from grain-oriented silicon steel, results in weight and size reduction as well as higher efficiency and possible cost savings. "E" cores can be supplied in a variety of window sizes and core areas from 1, 2, 4 or 12-mil Silectron strip, for high or low frequency 3-phase applications. ● All Arnold cores are made by precision methods, and carefully tested under closely controlled conditions to assure highest quality and reliability. *We'll welcome your inquiries.*

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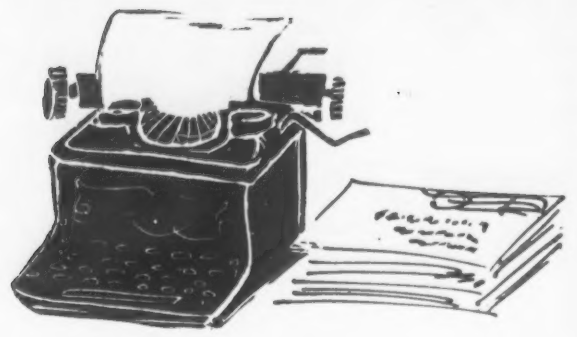
Letters to the Editor



Admiral Story

My dear Colonel Dixon:

You and your staff did a wonderful job on the Admiral Corporation article which appeared in the latest issue of SIGNAL. It was read here with a great deal of interest.

Sincerely yours,
ROSS D. SIRAGUSA
President
Admiral Corporation

Doing It the Hard Way

Gentlemen:

The "Schnicklefritz Alternator" in the November-December issue of SIGNAL is the "Goldschmidt Alternator."

HOMER D. JUGGERS
Box 43
Bolinas, Calif.

We received many answers to the quiz identifying Dr. Schnicklefritz as Dr. Alexanderson, and the equipment as the Alexanderson Alternator. Hope you named it right, but, if you didn't, don't give up. See page 28 for this issue's quiz.

Answers

Sirs:

Regarding the November-December quiz, it's the Goldschmidt Alternator which multiplies the frequency of an alternating current by factors or 4 or 5 and was constructed to 150 KW.

CLAYTON COOL, A2EBZ
Secretary
Knickerbocker Amateur Radio Club
New York City

Gentlemen:

I am very late on this, but just got around to it. The apparatus described on page 27 of SIGNAL Sept.-Oct. issue is known as the "Joly-Arc" system. It was developed by Count von Arca and employed at Sayville, L. I.

Let's have more of these. . . . I enjoy them.

FRANCIS S. DUNN
W8DTR
Dayton 4, Ohio

New Member

Dear Sirs:

Herewith my application together with the necessary fee for membership in the AFCA. This is one organization I should have affiliated with a long time ago as part of the requirements of a communications reservist in order to keep abreast of some of the technical goings-on in the world of communications. The various articles in SIGNAL will go a long way to achieve the "big picture" of things that are not ordinarily available to us in the not-active trade. Too bad, though, that this is a bi-monthly publication — makes for a long time between drinks.

HENRY SPILLNER
Major, USAFR
Teaneck, N. J.

Air Mail

Dear Editor:

The articles in SIGNAL are very informative, interesting and most enlightening.

The articles I like most are about different government agencies concerned with electronics and electronic research, manufacturing and scientific research. This gives me the complete picture from research to airman. For example in the November-December issue, such articles as "PM is not Poor Management," "Electronics Production Board," "From Scientist to Soldier," "Navy Frogmen," and "Radio Overhaul by American Electroneering" present a complete picture of the flow of electronics from imagination to practice.

The article "PM is not Poor Management," in my opinion should be circulated through every branch and every command of all the services.

S/SGT. JULIAN I. FEIGUS
775th Aircraft Control & Warning Sqdn.
Cambria, Calif.

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Dependable!
Accurate!
Send today for our new completely illustrated catalog of crystals or outline your particular crystal problem. Our engineers will be glad to make recommendations, at no obligation to you.
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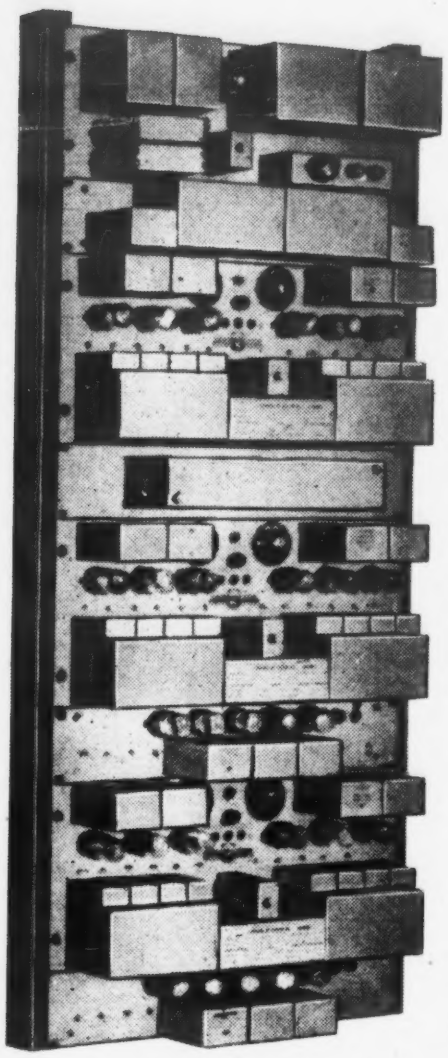


Let KELLOGG Carrier Cut Your Costs!

We say—"Cut maintenance costs with KELLOGG Transmitted Carrier Systems," because that's exactly what happens whenever these systems are installed. Enthusiastic endorsements by users supply the proof! —*Superiority proved by use!* . . . Kellogg Carrier is designed and built by *telephone* men—men who thoroughly understand exchange operation and maintenance.

Superiority
PROVED BY USE

Kellogg Transmitted Carrier Systems with Universal Signalling have met with enthusiastic commendation wherever they have been put in service. Their superior performance is not a matter of guess-work, but proved on the firing line in actual use! . . . KELLOGG CARRIER NOW AVAILABLE FROM WAREHOUSE STOCKS IN DALLAS, KANSAS CITY AND SAN FRANCISCO.

These Features will Save You Money

NO SYNCHRONIZATION

Separate oscillators are not required in the receiving end of the carrier terminal—each sideband is demodulated by the same carrier frequency which produced it originally. With Kellogg, you will have no need for synchronizing of oscillator-frequency.

NO FREQUENCY DISTORTION

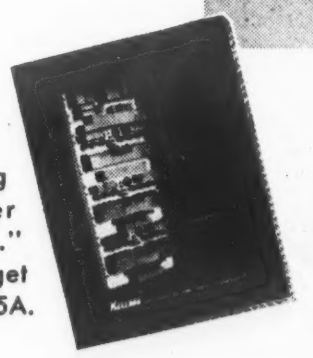
Continuously free of voice distortion due to frequency shift. Speech is always clear. Voice frequencies cannot be shifted by a difference in oscillator frequencies.

NO CARRIER LEAK ADJUSTMENT

You'll have no problem with carrier leak with Kellogg Transmitted Carrier Systems—No adjustments for eliminating or minimizing carrier leak are required.

SIMPLIFIED POSITIVE SIGNALLING

Kellogg Carrier Systems may be equipped with Universal Signalling (unit shown above) which permits use in either dial or ring down service by simple strapping changes on the terminal strips.



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An Associate of International Telephone and Telegraph Corporation

Communications and Electronics in the Army

(*Continued from page 22*)

its primary mission but that accessory functions of minor importance be eliminated. We fully realize that the objectives of increased simplicity and greatly improved performance are in many ways incompatible. We feel strongly, however, that by emphasizing the primary functions and reducing the accessory functions and those which are not absolutely essential, much progress can be made toward attaining increased simplicity.

Closely allied to this problem of attaining increased simplicity — or less complexity — in our electronic gear is the urgent necessity for eliminating unnecessary production costs. Recently we have been requesting manufacturers developing Signal Corps equipment to make an engineering cost analysis of development models and to point out to us those features of the design which would involve abnormally high production costs. Upon receipt of such reports, a compromise is then sought between the attainment of lower production costs on the one hand and the retention of optimum design and performance characteristics on the other. You will be interested to learn that the results of this cost reduction program have been and are continuing to be most gratifying.

In speaking to a group such as this, I realize that I have used the word "industry" as an all-inclusive term. In stressing industry's important contributions to the Army, I want it to be understood that I include in this term all of the varied research foundations and educational and communications organizations who are participating in this vast scientific effort. The Army realizes, of course, that our technological advances have come from the joint efforts of all of our research scientists in developing new techniques and materials, and from our industrial engineers who put such techniques and materials to practical use, converting an experimental "breadboard" model into an item which may be reproduced in quantity as a stable and reliable item. Similarly, we have benefited and are benefiting from the advances that are being made in the operating fields of our great communications companies.

Before this distinguished audience, there is no need to defend or explain the support which the Army gives to basic and applied research. We all recognize that creative and exploratory research supplies the vitality and intellectual substance on which our whole technology grows. History has shown that through creative research we can and must expect the technological break-throughs that push ever forward our scientific frontiers.

The philosophy on which we operate our own Signal Corps Laboratories is that we must keep a nucleus of qualified scientists and engineers within the Army who are constantly forging closer ties with science and industry in research and development on military problems, and who unite the efforts of our Armed Forces and the potential for electronics manpower and facilities in this country. In time of emergency, our expansion must always be toward the greater use and employment of the scientific and industrial strength of the country through increased contacts with the appropriate institutions and with industry. It is our constant aim in the Signal Corps to close the gap — both in time and space — between the front-line soldier on the one hand and the research scientist, production engineer and manufacturer on the other.

We are grateful for the contributions that you scientists, engineers, and communications operating personnel have made and are making to the end that our combat forces are afforded the benefit of the latest techniques in your chosen field. We solicit your help and cooperation in the future, for it is imperative that this help and cooperation continue if we are to maintain a margin of superiority in the military electronics field sufficient to discourage any potential attacker and thus insure a lasting peace for our country.

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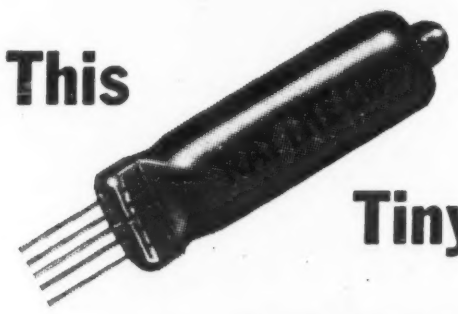
Excellence in Electronics

From This



Tiny Tube . . .

A HARVEST OF HAND RADIOTELEPHONES

The subminiature tube, a Raytheon development, made possible this lighter, more compact hand transmitter-receiver AN/PRC–6. Raytheon developed and is mass-producing this equipment . . . another Raytheon contribution to improve the effectiveness of our Armed Forces.

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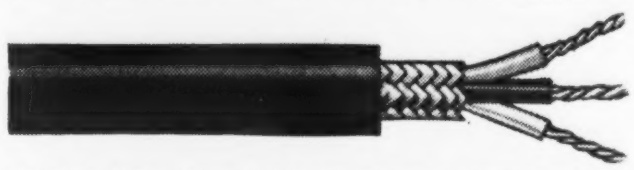
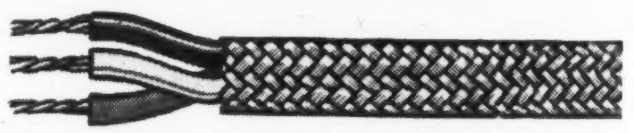


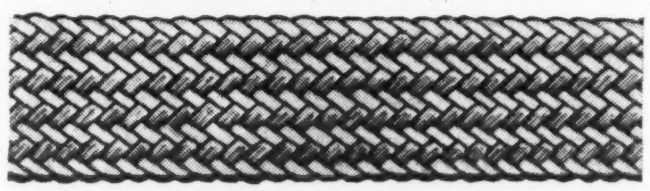
SHIELDED JACKETED MICROPHONE CABLE
Conductors: Multiple—2 to 7 or more conductors of stranded tinned copper. Insulation: extruded color-coded plastic. Closely braided tinned copper shield. Tough, durable jacket overall.

RF CIRCUIT HOOK-UP AND LEAD WIRE
for VHF and UHF, AM, FM and TV high frequency circuits. LENZ Low-Loss RF wire, solid or stranded tinned copper conductors, braided, with color-coded insulation, waxed impregnation.

JACKETED MICROPHONE CABLE
Conductors: Extra-flexible tinned copper. Polythene insulation. Shield: #36 tinned copper, closely braided, with tough durable jacket overall. Capacity per foot: 29MMF.

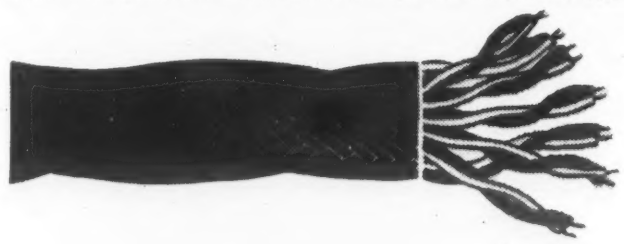
SHIELDED MULTIPLE CONDUCTOR CABLES
Conductors: Multiple—2 to 7 or more of flexible tinned copper. Insulation: extruded color-coded plastic. Closely braided tinned copper shield. For: Auto radio, indoor PA systems and sound recording equipment.





TINNED COPPER SHIELDING AND BONDING BRAIDS
Construction: #34 tinned copper braid, flattened to various widths. Bonding Braids conforming to Federal Spec. QQ-B-S75 or Air Force Spec. 94-40229.

SHIELDED COTTON BRAIDED CABLES
Conductors: Multiple—2 to 7 or more of flexible tinned copper. Insulation: extruded color-coded plastic. Cable concentrically formed. Closely braided tinned copper shield plus brown overall cotton braid.



PA AND INTERCOMMUNICATION CABLE
Conductors: #22 stranded tinned copper. Insulation: textile or plastic insulated conductors. Cable formed of Twisted Pairs, color-coded. Cotton braid or plastic jacket overall. Furnished in 2, 5, 7, 13 and 25 paired, or to specific requirements.

CHECK LENZ FIRST!

Lenz Electric Manufacturing Co.
1751 N. Western Ave., Chicago 47, Illinois

cords, cable and wire for radio ◆ p. a. ◆ test instruments ◆ component parts

Electronics in Space

(*Continued from page 25*)

Instruments for collecting data to count and identify the cosmic ray particles, designed by NRL, are contained in a second gondola. This equipment does two things. First, it detects or counts the cosmic rays, and second, identifies them as to their charge by measuring the ionization they produce.

This is done by a cosmic ray telescope consisting of Geiger counters pointed toward the vertical. Arranged within this first telescope is a second one of proportional counters which points in the same direction and measures the ionization of the particle selected by the first. Thus the "Geiger-Proportional" counter telescope, as it is called, detects a cosmic ray and measures its charge by the ionization produced—in general, the greater the charge the greater is its ionization. Lead absorbers and additional Geiger counters placed below the telescope give information on the penetrability of the detected particles.

In order to interpret and record the information from the Geiger and proportional counters, additional pieces of instrumentation are necessary—these account for 95 percent of the scientific weight within the pressurized gondola. They are the Geiger counter coincidence circuit and proportional counter amplifier which supply information from their respective telescopes to the cathode ray tube recorder. Batteries supply the necessary power.

The coincidence circuit detects a particle passing through the telescope then tells the cathode ray tube recorder to record the ionization produced in the proportional counters, which it does with the help of the proportional counter amplifier. On the recorder film, the passage of a particle through the telescope is indicated by a line whose height is a measure of the particle's ionization; its penetration is also recorded. Time and the altitude of the gondola are recorded periodically to complete the necessary data.

These data do not need to be telemetered back to earth, since the instruments themselves are recovered when the gondola returns to earth when separated from the balloon after a flight of 24 hours.

Means, too, have been developed for recovery of equipment and film records from rockets. It was found that destroying the rocket's streamlining by detonation of appropriately placed explosives caused large portions of the missile to return to the earth at slow enough rates to permit such recovery. This procedure has been particularly satisfactory in the case of the Viking rocket; rockets have been severed at an altitude of 30 miles on their descent, and records, rocket components, and instruments — including transmitters — recovered, even in reusable condition. Telemetering was used exclusively to obtain data from Viking 4, however, which was fired in May, 1950, from the deck of the USS Norton Sound, a seaplane tender that had been converted by the Navy into an experimental guided-missile ship.

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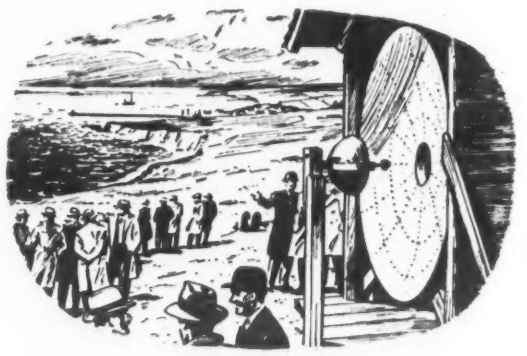

IT&T engineers successfully demonstrate first voice transmission by microwave, Calais to Dover, March 31, 1931

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For information on microwave communication systems, address: *Federal Telephone and Radio Corporation*, 100 Kingsland Road, Clifton, N. J.

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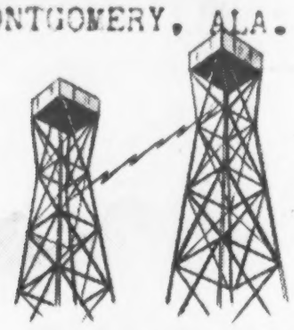
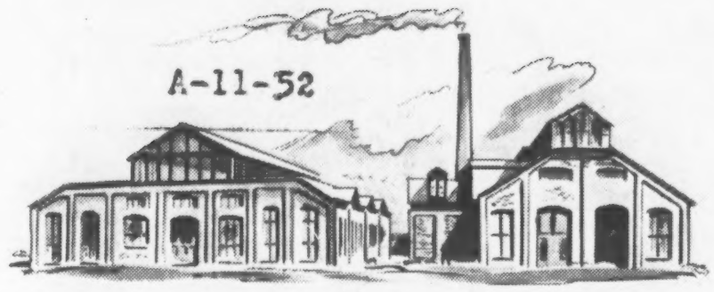


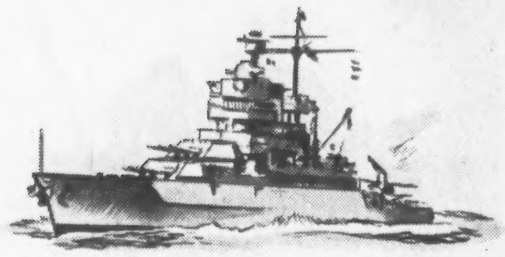
1922—First power line carrier current equipment installed.

1944—First application of frequency modulation to power line carrier current equipment.

1947—First microwave relay system in commercial operation.



1875—Elihu Thomson, one of the founders of General Electric, transmitted and received wireless signals for a distance of about a hundred feet.



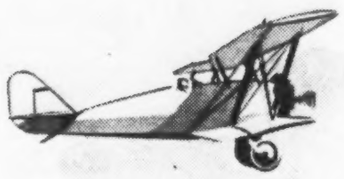
1915—Sample radio-telephone transmitter installed on two U. S. battleships and used in 1916 Spring Naval Maneuvers.

1931—Sonic locator developed for use by ships in fog. It was the first step toward radar.

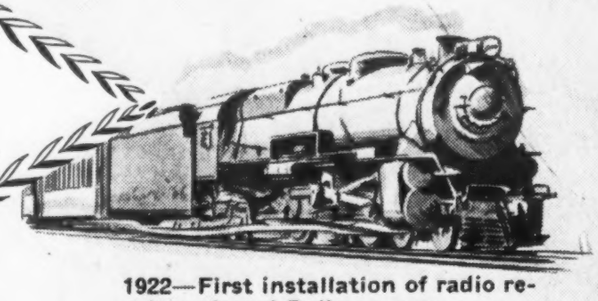
1937—First application of radio communication aboard fireboats. New York City Fire Dept. installation.

1878 **75** 1953

YEARS OF ELECTRICAL PROGRESS



1923—First airmail plane radio communication equipment installed and tested.

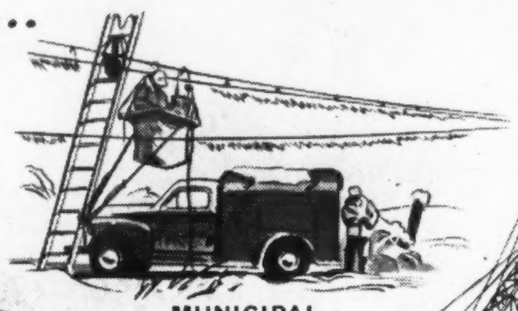


1922—First installation of radio receiver aboard Pullman cars.

1927—First front-to-rear railroad communication equipment installed.

and today...

INDUSTRIAL 2-WAY RADIO



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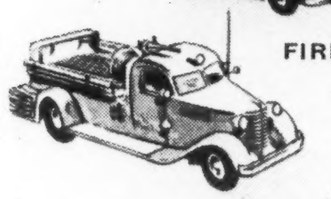
POLICE



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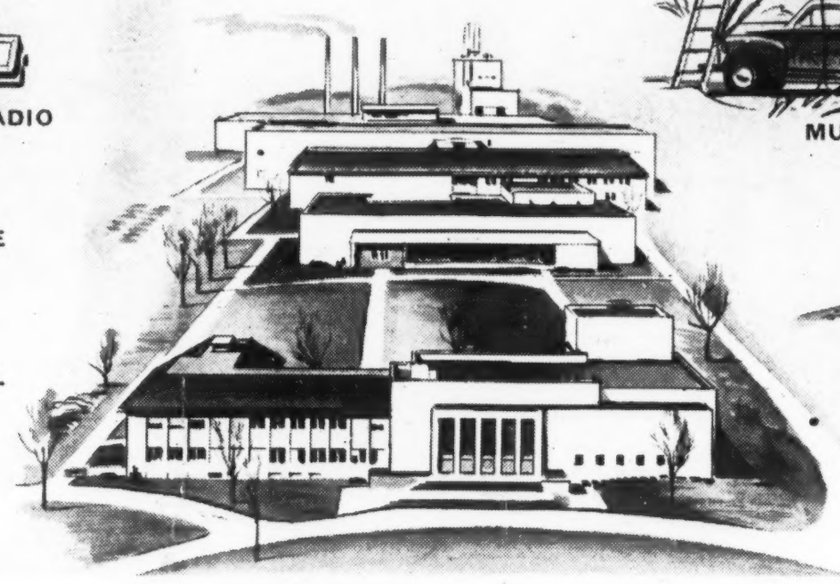

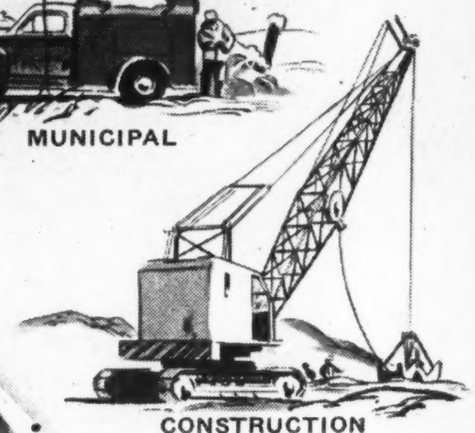

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